Science AMA Series: We are Dr. Rich Helling and Dr. Han Zhang from Dow, here to talk about sustainability and applying Life Cycle Thinking to guide choices. AUA!

Dow$_C hemical^1 and r/ScienceAMAs^1$

[1]Affiliation not available

April 17, 2023

Abstract

Who has the better sustainability profile, a vegetarian who drives a Hummer or a meat-eater who drives a Prius? Is it always better to buy local produce? Is a new innovation – really "more sustainable" than the existing alternative in the grand scheme of things? The answers are complicated. The reality is that people make choices daily around what they perceive to be a more sustainable option, but the real answer is often not intuitive. In this AMA, we'd like to talk about the concept of life cycle thinking as a framework for understanding sustainability holistically. We have spent our careers assessing the products people make or buy, from raw materials to end-of-life, from "cradle to grave." We will discuss Life Cycle Assessment, a specific science that measures the mass and energy flows to determine the potential impact of "stuff." There are also simpler tools that you can use to incorporate life cycle thinking into a much broader range of decisions – from questions around R&D investments, to what to buy the next time you stop at the store. RICH HELLING: I am chemical engineer (Sc.D. from MIT) and the Director of Sustainable Chemistry at Dow. I have been with the company for nearly 30 years, and for the last decade, I have concentrated on how to use life cycle thinking – in particular applying LCA and related tools to identify opportunities for innovation and to differentiate new products in the marketplace. I have authored 23 papers and hold two patents. I am a certified LCA Professional, a member of Michigan's Green Chemistry Roundtable and active in working groups of The Sustainability Consortium. HAN ZHANG: I am the Sustainability and Advocacy Manager for one of Dow's business units and have extensive experience managing the company's sustainability reporting, including publication of our Global Reporting Index (GRI) G4 Annual Sustainability Report and annual submissions to the Dow Jones Sustainability Index. Previously, I worked in life cycle assessment, biofuels development and strategic implementation of alternative energy plans in the energy industry. I hold a PhD from the University of Michigan's School of Natural Resources and the Environment, as well as master's and bachelor's degrees in thermal engineering from Tsinghua University in China. We will be back at 1 pm ET (10 am PT, 5 pm UTC) to answer your questions, ask us anything! Thanks for the many questions and the great discussions! It's great to see the excitement and insights about life cycle and sustainability topics. We have to go now, but will try to get back to some of the questions!

the WINNOWER

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DOW_CHEMICAL R/SCIENCE

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In this AMA, we’d like to talk about the concept of life cycle thinking as a framework for understanding sustainability holistically. We have spent our careers assessing the products people make or buy, from raw materials to end-of-life, from “cradle to grave.” We will discuss Life Cycle Assessment, a specific science that measures the mass and energy flows to determine the potential impact of “stuff.” There are also simpler tools that you can use to incorporate life cycle thinking into a much broader range of decisions – from questions around R&D investments, to what to buy the next time you stop at the store.
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CORRESPONDENCE:

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Hi guys! I work in renewable energy storage and a question which comes up a lot is the sustainability of batteries. What's your view on the recent offerings of domestic scale storage by Tesla, Mercedes etc?

Partybot5000

Thanks for the question! This is Rich. Energy storage is a great topic for applying life cycle thinking. There's little reason to store coal-produced energy (from a climate change point of view), but it is essential to have efficiency energy storage linked to intermittent forms of renewable energy. Better systems for energy storage are needed. In any application of electricity, one must consider how the

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electricity is generated.

What *kinds* of recommendations do you make? How do you approach communicating with the general public?

In my view, sustainability/environmental professionals are in danger of confusing consumers to the point of inaction.

Plastic grocery bags are a good example. Selecting paper over plastic doesn't have much of a beneficial impact, if it even has a positive impact at all. And yet for a period, consumers acted as if that decision was most important environmental decision that they made in the supermarket. (And we know it's very, very far from that.)

In my view, professionals like you need to focus on recommendations about *product-category* decisions rather than *product* decisions, and make recommendations that are easy to understand and (hopefully) follow.

Don't tell people which car to buy (a product-level decision), tell them how to get the service of transportation (a product-category decision). Walking, biking, and taking mass transit (product category) are all much more important than selecting a Camry versus an Accord (product-level).

Recommendations at the product level (e.g., taking Colgate toothpaste over Crest) tend to be sensitive to where the person is living and what environmental impacts they care most about. They're fragile recommendations (e.g., because they rely on assumptions and data they rely on aren't particularly generalizable). And so, professionals in this field end up sending mixed messages to consumers who want to care, but get disheartened when they put effort into doing the right thing, and it turns out that it's not the right thing after all.

It reminds me of the nutrition field, which can't make up it's mind about a lot of different foods, such as eggs. Are they good or bad for you? They're not really clear either way, so as a consumer, I eventually say, "Forget it. I'll eat eggs if I want to."

Environmental messages are in severe danger of generating apathy in the same way.

I can (and have) written about all this for hours, so I should stop here and say that I'd be happy to hear your thoughts.

DrSustainability
This is Han. Hello DrSustainability, great question! Communication is a key issue, and LCA can help with communication. Using your example on plastic bags, a thorough, scientific and metrics-based approach, such as LCA, can move people away from emotions and begin discussing the facts. Sometimes, we cannot change what the fact are, but we can encourage people to think critically about the big picture and what the facts mean.

On your question on product category, I agree sometimes we should focus on the big picture. However, we may also need to be careful when comparing different categories, such as walking, biking and driving. They have different functional units.

As a biologist who studies life history evolution (think about how tadpoles have different abilities and problems than adult frogs), your concept of Life Cycle Thinking is intriguing. It sounds a little bit buzz-wordy/marketing lingo, so...

Would you elaborate on the specifics of what Life Cycle Thinking and Assessment means to you and perhaps its philosophical and empirical history?

Jobediah

Life cycle assessment (LCA) and life cycle thinking have been around as a (small) discipline for more than 20 years. In part, it grew out of the concept of "industrial ecology" - that, like in nature, the waste of one thing is (or should be!) the food for another. There is a international journal of LCA, and American Center for LCA (a professional society) and strong LCA activity in the world of toxicology (SETAC) and the UN Environment Program. The International Standards Organizations (ISO) created standards for rigor and transparencies in doing LCA in part due to more egregious claims in the first uses of the concepts. LCA can be used for commercial claims, but I think the much greater value (for a company) comes from using LCA to understand where "hot spots" are and where processes and supply chains can be improved.

Thanks for doing this AMA. I knew I recognized your names as my own dissertation's bibliography included a lot of your work. I conducted the life cycle inventory and assessment of wood and switchgrass biofuel pellets. During my work what I found frustrating about the LCA process is: 1) a percieved lack of US data (US LCI/ecoinvent) that leads to 2) a sometimes rather heavy reliance on assumptions.

While my research expanded on my inventory and assessment to include implications for government policy in the US, I became a bit disheartened by the value of LCA until our US data expands. Of course it can only do that by conducting more and more inventories.

So my questions to you both are:

Since 2012 (when I did my research) has US data expanded or improved significantly? And does DOW encourage or fund scientists or Universities to expand inventories?

Where are we globally on agreeing on LCI/LCA standardization. Have the ISO standards been revised lately?

Thanks for your time! I'm a fan of LCA as a concept and tool; I really hope it continues to gain traction!

DrDueSs

This is Rich. Thanks for the question! This is one of the big challenges with doing LCA - the data we need is not always the data we have. The US NREL LCI database has not been updated recently. I do push for database updates and improvement whenever I have the chance, though we have not funded university work on that. I know that in the US chemical industry we are working on updating our LCI industry, and do that with more regularity in Europe. We will more often work with trade associations, like PlasticsEurope or the American Chemistry Council, to pro-actively update our LCI databases.

So, who really does have the better sustainability profile, a vegetarian who drives a Hummer or a meat-eater who drives a Prius?

ek_ladki

Thanks for being interested in the headline! My favorite way to say that is that the answer is "It depends!". For the Prius/meat comparison, two key things it depends on are the miles per year driven and the meat or other protein source consumed per day. If you don't drive much, being the vegetarian in the Hummer is better, at least compare to a beef eater (not compare to a chicken eater)! And in my back-of-the-envelope comparison, one can find the miles driven or meat eaten that flips the choice of "best". So the question helps to think about what are the key inputs and issues. Personally, I've got a Prius, but 9 months out of the year can ride my bike to work - a benefit of small-town living!

I've recently changed to a vegan diet, and this is something I've been wondering about quite a

lot. Sometimes I've noticed the facts and figures hard to find, as sources often seemed biased, but I can't be sure. I hear lots of tales of how much much food and drink cattle, for example, need on factory farms. Can you tell me whether going vegan does give me a much better "sustainability profile", as it were? Or just expand on those first few questions you posed in the AMA description?

herrbz
This is Rich. I'd be happy to make some generalizations here! Yes, meat (beef in particular) is more resource-intensive to produce and generates more emissions (global warming, eutrophication) directly from beef production and the grain to feed them. The difference is not as much for chicken. And there are ways of doing vegan "poorly" - such as buying off-season, greenhouse grown produce. There was a great study a few years back showing that field grown produce imported from Spain to the UK was advantaged compared to growing under glass in the UK.

What is something very unsustainable that people do and hasn't been addressed yet?

angryification
This is Han. Hello angryification, whether something is sustainable or unsutainable, it depends on many factors. For example, a reusable bottle can be better than a single use plastic bottle only if people reuse it more thant 10 times. And it also depends on how you wash your bottle.

What is something very unsustainable that people do and hasn't been addressed yet?

angryification
This is Rich. Thanks for the question! There are many things we (in the US) do that are clearly not sustainable if extrapolated to global use - long daily commutes in private cars, energy-intensive homes and diets. There are ways to address these, but not in wide enough use to be considered totally "sustainable" today. Perhaps the one that is not a visible today (at least outside of California!) is water use, especially use of "fossil" water. Water is still much undervalued, though it is much more of a local or regional issue.

How does Dow implement your findings?

One of my concerns is thorough testing of new compounds; for example, it seems the substitutes for BPA are just as bad as BPA, and there are a lot of compounds that are invented and used without any significant testing. One example:

perfluorooctanoic acid/C8 "to replace C8, DuPont has simply turned to other closely related substances, such as perfluorohexanoic acid, or C6. Under the current regulatory system, DuPont is not required to ensure that these chemicals are free of the qualities that made C8 so toxic." "Bilott came across a single paper that mentioned the presence of a little-known substance called perfluorooctanoic acid in Dry Run Creek. Bilott requested more information on the chemical, which is often called C8 and is found in thousands of household products, including carpeting, Teflon pans, waterproof clothes, dental floss, kitty litter and cosmetics. Unbeknownst to Bilott, his inquiry triggered a panic inside DuPont's Delaware headquarters. "The shit is about to hit the fan in WV," the company's in-house counsel, Bernard J. Reilly, wrote in an email to his colleagues. "The lawyer for the farmer finally realizes the surfactant [C8] issue … " "Despite everything he has been through, Wamsley does consider himself fortunate in one respect: He is the only designated C8 tester who is still alive. "It looks like DuPont might have known this chemical was dangerous and used some of us as guinea pigs," he says." -- "Welcome To Beautiful Parkersburg, West Virginia!" 08.27.2015

redmeanshelp

This is Rich. Thanks for the question. I can't comment on DuPont history. One needs different tools and data before launching a product. LCA is great at some things, and not at others. It's great for understanding energy and resource use and "macro" emissions, but less so for toxicity related emissions, since the uncertainty in the models for toxicity in LCA is large. Risk assessment and hazard assessment would be done using other approaches, and all of these need data. One of or 2025 sustainability goals focusing on developing and using better predictive modeling tools for product safety. This is important work.

Hi there. I like a lot your premise, that "the answer is complicated". Too many people think that things are simple and clear cut when they actually depend a lot.

Since you mentioned meat-eaters in your post I was wondering if you can give an assessment of the actual impact of meat. How much does it vary? Is eating beef in european nations, where forests have been improving for the last century, as bad as in other places with rampant deforestation and other well known issues?

lucaxx85
This is Rich. I agree the answer is complicated! My favorite way to say that is that the answer is "It depends!". For the Prius/meat comparison, two key things it depends on are the miles per year driven and the meat or other protein source consumed per day. And in my back-of-the-envelope comparison, one can find the miles driven or meat eaten that flips the choice of "best". Your point gets at some of the details of figuring the burden from meat - there is a wide range of values - grain feed vs. free range, for example. So although some trends are very clear (beef is more burdened than chicken or vegetarian options) the exact magnitude depends on the specific scenario that you're interested in.

What would you say is the simplest and most beneficial switch that consumers can make to employ these forward-thinking ideals?

theres_two
Hi theres_two, this is Han. good question, unfortunately, nothing is really simple. But I can share some general rules of thumb which may help us make better decisions:

1. normally, if the product requires energy or fuel to use it, then the “use phase” is absolutely the most important thing to focus on. So when you make a purchase, you need to consider the use phase.
2. Using less stuff to make something is a good thing
3. Using recycled or waste materials to make something is a good thing
4. Using bio-based materials always has trade-offs and is often not a good thing

Last but not least, simple (or less process) is usually better than complex.

As I understand it, sustainability involves an evaluation of not just economic and environment, but also social impacts. What LCA (or LCA-like) tools are available to assess the social side of sustainability?

irreducible_element
Hi irreducible_element. This is Han. You are completely correct. Economic, environmental and social impacts are all important issues. There are some studies on social LCA, such as http://www.lifecycleinitiative.org/starting-life-cycle-thinking/life-cycle-approaches/social-lca/.

However, social LCA can be very different to economic or environmental LCA. For example, we may apply cut-off rule to ignor some less impactful process in environmental LCA, but we can apply the same rule in social LCA. Because if there is an issue like child labor or safety concerns, no matter how small it is, we can't ignor it.

Do you consider fossil fuels to be a bridging measure until renewable energy is implementable on a global scale? Or, is renewable energy already there, and political and business interests are stunting deployment?

As an aside, are there any particular types of renewable energy you favor or that the public may be unaware of?

Pour_Louis
This is Rich. I agree more with your first comment - it is more clear every day that we need to reduce fossil use as fuel use due to global warming impacts long before we will "run out" of them or they are priced out of use. We still need improvements in renewable energy technology, particularly energy storage for intermittent storage. Personally, I think we (as a society) should be more open to nuclear - one can view it as a tradeoff between a highly local issue (nuclear waste) vs. a diffuse global one (climate change) - and I am more optimistic we can manage a local issue.

From an economic perspective and for the purposes of sustainability indicies, what method, if any, is used to evaluate trade offs between conflicting goals of sustainable products? That is to say, if I emit an additional 1 Ton of CO2 equivalent greenhouse gas to recycle 10 kg of a metal, what method decides if this is a net plus for the environment?

Economists attempt to assign dollar values to such externalities and public goods as much as possible, but estimates are often ambiguous. For example, when the Obama administration brought together various federal agencies to standardize disparate estimates for the marginal harm of greenhouse emissions for regulatory calculations, the final product was still a 95% confidence interval that spanned an order of magnitude. How does such uncertainty factor into lifecycle sustainability estimates that businesses and consumers need to use to make decisions?

ISBUchild
This is Han. Hi ISBUchild, great question and this is a topic I studied during my PhD work. One way to evaluate the trade off between objectives is the multi-objective optimaztion method. You can plot the result on a pareto curve and make different decisions under different situation. Therefore, LCA can be used as a decision making tool.

Converting different metics into dollar value is another way to do it. It's similar to apply a weight factor to different things. However, the result will depend on how people value things or willingness to pay on different environmetal impact. You may lose the beauty of seeing the pareto curve.

Hi Dr. Rich and Dr. Han!

I have some more general questions on the topic.

To what extend do you include biotechnology in the life cycle thinking? By that I mean production of biofuels, colours, gases with biotechnological processes and organisms (algae, microorganisms). What about biotech production of useful items from waste?

How do you successfully communicate on the topic with general public and government? How do you tackle the education on sustainability throughout different fields of professions? How do you promote a public discussion?

What would be your recommendation for the "mindset change" of people. Numerous people know about the sustainability problem yet very few people do something about it. Since people are not directly affected they will not change their minds. One way is to integrate such topics

into the education system - primary, high school and universities. How else would you activate people to care about sustainability?

I would be more than happy to read your thoughts.

amazingglassofwine
Dear amazingglassofwine, this is Han. For your first question, we always consider mutliple factors, such as economics, environmental impact, scale up feasibility. For example, Dow recently signed a 200MW wind deal, which made Dow the first company in the U.S. to power a manufacturing site with renewable energy at this scale, and will become the third largest corporate purchaser of wind energy in US. This new wind deal results from Dow's long-term COAT vision and strategy as outlined in the Dow Energy Plan, a four pillared, global approach to Energy and Sustainability: - Conserve by aggressively pursuing energy efficiency and conservation. - Optimize, increase and diversify domestic hydrocarbon resources. - Accelerate the development of cost effective clean energy alternatives. - Transition to a Sustainable Energy Future.

For your second question on education, it's important to bring sustainability into next generation's education. In addition, we should also focus on bringing more "science" into classroom. Dow is a big supporter to the STEM education. We believe to build the workforce of tomorrow by empowering teachers, motivating student achievement, developing careers, and collaborating with communities to transform STEM education into a driver for innovation, manufacturing, and economic prosperity.

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amazingglassofwine
This is Rich. In addition to Han's comments, I'd also through in a couple of simple ideas he mentioned in a different post: 3.Using recycled or waste materials to make something is a good thing 4.Using bio-based materials always has trade-offs and is often not a good thing LCA is a great tool to quantify and frame the trade-offs for bio-based systems, and are what I got my start in LCA looking at.

How do you respond to the criticism that life cycle assessment often uses mathematical guestimation in many areas along the way and cannot be viewed as a reliable means of obtaining an accurate total?

It's good to see Dow hire some people focused on environmental impacts. How much of a priority is reducing point source pollution by Dow's own chemical factories in the current administrative culture at Dow?

Triptolemu5

This is Rich. Thanks for the questions. Yes, there will always be assumptions used in LCA - hopefully the authors are transparent in describing what they are and using sensitivity analysis to understand how critical the assumptions are to the analysis. But LCA, despite some trends this way, will never be a label exactly like a nutrition label, since one can independently measure nutritional attributes of food, but can't measure it directly - it must be calculated and data (or clear assumption) based.

We know from LCA (and other tools!) used in the past that looking at the "footprint" of our operations was important. Our first "EH&S" goals (created mid 90's for 2005) focused heavily on our footprint (energy use, emissions, and safety) and were tremendously successful - 20% less energy, huge benefits in worker safety. The next set of goals - our 2015 Sustainability goals - continued the focus on footprint and added more on the "handprint" - how our products are used and bring benefit. Our latest 2025 goals continue to have clear and specific focus on our operations. It has been exciting to see the progress here over my years at Dow.

Hi Rich and Han! Thank you for getting the word out on LCA!

My first question is what kinds of recommendations do you make? From my understanding you can only conclude from LCA that one product is better with respect to greenhouse gas emissions but is worse with respect to polluting water ways, for example. Are you expected to make an overall determination of which product or process is more green? How do you weight those factors (GHG emissions vs. eutrophication vs. contributions to smog etc.) in a decision?

My second question is how did you go about steering your career in the direction of sustainability? As a chemical engineering student with a huge passion for making the world greener, I would love to learn how you got to where you are today!

random2248

Hi random2248, this is Han. For your first question, as I mentioned early, one way to deal with the tradeoffs between metrics is to do a multi-objective optimization. It will give you more insight and help make better decisions. For example, when you decide whether you want to reduce GHG or maximize profit, a multi-objective optimization can help you make a choice under different carbon tax or trade system.

For your career question, I think we all passionate about sustainability. LCA is a very natural way to understand sustainability issues. that is how we start.

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random2248

This is Rich. In addition to Han's comments, I'll show my personal bias in saying ChemE can be very good LCA practitioners! You already know, and have now an almost instinctive, grasp of the concepts of mass balance and process flows. LCA essentially just adds another way of using those concepts (and data).

I have heard an interesting principle regarding looking at the "whole picture" in terms of making sustainability-related decisions, and how this can vary based on your geographical area.

For example: "It may be more sustainable to drive a car fueled by gasoline than electric car, if in a state where the source of that electricity is from burning coal, rather than from, say, hydroelectricity or wind turbines"

Do these types of decisions actually vary significantly among different regions? If so, how can one make proper sustainability decisions with resources available? Thanks

DoctorDogg
This is Rich. Thanks for the question! Yes, regions matter a huge amount. One way is in the source of power. Areas that use mostly hydro or nuclear power have a very low climate change impact (France, Sweden, Washington State) compared to ones that use mostly coal for power. Any process or product that uses electricity will have quite a different impact depending where it is used. Also, the importance of water (as in input) is hugely different for a use in Midland vs. doing the same thing in Texas. Finally, the importance of some emissions - like eutrophication due to P or N - depend on where the emissions end up - the "dead zones" in the Gulf of Mexico make N emissions that end up there more critical than ones going other places.

Hello Dr's! I work in a field that consumes more energy and produces more waste than any other - the construction industry. I'm an architect and did an AMA a while back about low energy/ sustainable buildings.

My question is - the vast majority of buildings are built using conventional construction methods as contractors tend to be very risk averse and because of the scale of money involved even a 1%-2% increase in cost usually means not using a superior product ("value engineering"). The materials exist, the knowledge to use them exists, but how do we actually get contractors and owners to utilize better technology and construction methods?

Logan_Chicago
Hi Logan_Chicago, this is Han. I think you just hit the nail! The construction industry is indeed conservative and risk averse. One of the reason is the building codes. They are developed to protect people and ensure safety. However, many of them are out dated and are not updated frequently enough. To encourage contractors to adopt new methods or use new materials, we will need to 1. work with rule makers and agencies 2. demonstrate the value of new methods to contractors 3. push from general public, such as the desire of green buildings 4. competition among contractors, such as getting more LEED points.

What a great AMA, thanks for taking the time and thanks for helping to educate people on this very important subject.

How much more sustainable is grass fed meat v.s. conventional?
If quantifiable, what is the carbon offset, if one buys 50% of their produce locally?
Are hybrid cars that much better for the environment?

djembeplayer
This is Rich. Some of your questions are easier than others! The grass vs. feedlot comparison depends a lot on the specific details - manure management, accounting for changes in soil carbon, the weight of the cattle (typically less for grass fed). And "sustainability" includes not just greenhouse gases but other issues as well - "eat more chicken". The comment from psychonaughties is good - it does depend on the trucks and distance of the local farmer and what you are comparing it to. Ocean or

rail shipping is very energy efficient - a truck from port or warehouse to the store or your car to the store are likely larger burdens than long-distance shipping. And a field grown crop from a further distance can be advantaged to a local one from a greenhouse. There was a good paper a few years ago that estimated that "going meatless" one day per week for a typical American would have as much benefit as getting ALL your food from next door! A good rule of thumb is to enjoy things in their season! And yes, hybrid cars are better, simply by the higher MPG (the extra burdens to create the vehicle are less than the fuel savings over the life of the car).

Where was a case that LCA was ignored with significant consequences?

foodRus
Dear foodRus, this is Han. One example is the first generation biofuels. People forget to take into account of indirect land use change in the full life cycle of biofuel. Many studies show that after considering the ILUC corn ethanol is not as attractive as people originally thought. Fortunately, people figure it out early enough to prevent more serious consequences.

How do we reconcile corporate America with sustainability? In other words, how can we live in a system designed for profit and inequality while working toward or achieving sustainability?

All_is_well_yall
This is Rich. This is the BIG QUESTION. It is the system we have, and is the one to work in. I firmly believe that businesses and markets can respond quicker and more effectively than governments - not all the time, but particularly for issues like climate change, which is a classic "tragedy of the commons" in progress. Corporations can do things, globally, effectively. We need to encourage and inspire the long-term perspective that is needed to make this happen.

How do we reconcile corporate America with sustainability? In other words, how can we live in a system designed for profit and inequality while working toward or achieving sustainability?

All_is_well_yall
Hi All_is_well_yall, this is Han. The time of reconcile Corporate with Sustainability is here! Dow launched its 2025 Sustainability Goals to help redefine the role of business in society. Sustainability can contribute to company's topline growth (e.g. new market on sustainable products), bottomline growth (e.g. energy efficiency, safety), and society. Check out examples and report at http://www.dow.com/en-us/science-and-sustainability/sustainability-reporting

I have a BS in sustainable management. My question is for Dr. Zhang.

I have been very interested in sustainability reporting since before beginning studies. Through your experience do you see sustainability reporting to be a long term trend or is it something that is only fashionable now to appease stockholders and improve corporate image?

Do you have any career advice for someone who would like to become a professional in this area?

VegPan
Hi VegPan, this is Han. Thanks for your question. I believe a transparent and comprehensive sustainability reporting is the long trend and it's our stakeholders are looking for. Several initiatives are pushing it more forward, such as GRI, SASB, Integrated Reporting.....

To be an effective reporter, first you need to have a good fundamental engineering mind, because you will deal with a lot of numbers. Second, you need to be good at project management. Third, it's

important to be curious and have an open mind to drive continous improvement.

Hey guys. I work in sustainability, specifically agriculture, and have been working on a theory or belief for a while and wanted your input.

In my experience, there are two main "camps" in agriculture. The "conventional" group which experiences great yields, uniformity, reliability, etc, but which can have very high inputs and sometimes negative effects on the environment.

The other camp is the "organics" type guys. They tend to have much lower yields, but also lower inputs and fewer negative impacts.

I have worked in both groups, and noticed a distinct polarization. Those in the organics tend to speak vitriol about conventional growers as if they were monsters, and although they often have their heart in the right place they are usually delusional about the practical chances of replacing conventional production with their style while feeding the ever growing population.

Those in the conventional group tend to reject anything that even suggests organics/sustainability outright as if there were nothing to it.

So to conclude my rant, my belief (have grown MILLIONS of vegetable plants in every different system possible) is that we need some sort of hybrid system combining the best of both worlds. Things such as bacterial and fungal symbiosis have been shown to have fantastic benefits even in hydroponic scenarios, and bio-control of pests is becoming even more attractive as pesticide resistance increases. Conversely, some things are conventional for a reason. Many nutrients simply do not become soluble enough for effective drip use, and there are many VERY labor-intensive things required for non-conventional growth (like tilling, filling bags, flushing pipes, etc) which in some cases drive the labor costs so high that it offsets any benefits the system would have.

So, do you think that there should be more co-operation between conventional and organic-sustainable-ecofriendly agriculture?

Potentialmartian
This is Rich. Good comments. Yes, the discussion is often quite polarized and not-science-based. We need all options to feed 9 billion people (2050 estimate, more or less), and as you point out, some systems make more sense for some crops (and locations) than others. For example, I enjoy the diversity in taste offered by heritage plants, and know that keeping such diversity available is important in the long term, but they are not often the most productive per acre. We need markets - and farmers - for both.

Is planned obsolescence a factor in Life Cycle Thinking? What are sustainably conscious companies doing to curb the creation of intentionally disposable items that aren't really disposable? It seems we spend an inordinate amount of resources allowing companies to create things that will break a year later, to inflate demand for their products, so they can make more profit. Without a change in this kind of economic model, do you see this burden being minimized to a point of sustainability? Is there a push for modular engineering to reduce the amount of waste we create? I feel this is an aspect of sustainability that I rarely hear mentioned. I am very passionate about it though and would love to find out more ways to help create solutions. Do you have any recommendations on how I can create the biggest impact in this area? Thank you so much for your time. Keep on fighting the good fight, it means the world, literally!

OperationCorporation

This is Rich. Yes, planned obsolescence is something that life cycle thinking should prevent! Looking at life extension and durability of products is an important part of LCA and should be in any kind of early-stage sustainability screening tool. In LCA, we use the concept of "functional unit" to encourage durability. Unfortunately, for some products current consumer tastes change faster than the products wear out, so things get disposed of long before they have been fully used. The mantra of "reduce, reuse, recycle" (the top their tiers of the well-known "waste hierarchy") are worth repeating. In our LCA work, we can see that being able to use recycle materials can have very clear advantages when it is feasible (technically and economically).

Is there any compelling reason to have so many different plastics used in food packaging? What if all tubs and bottles had to be, say, HDPE with 30% post consumer recycled material?

thenewestnoise
This is Han. Hi thenewestnoise, Yes! we need many different plastics for food packaging. They provide different function, such as stength, oxygen resistance. It's true that so many different types make recycling difficult. However, most of them can be recycled or recovery for energy. The problem is that people are not educated to sort, dispose and recycle them properly. Dow is working with other companies and industry associations to improve it. Check out the innovative Energy Bag program we did in Citrus Height, CA. http://www.dow.com/en-us/packaging/sustainability/energy-recovery

LCA is an powerful but complicated tool, and I was wondering about your thoughts on how (and if) LCA should support direct decision making between products. More technically speaking there are the attributional (book-keeping) and consequential (what-if) approaches to performing LCA studies and I would be interested in your views on their pros and cons and if Dow has applied consequential LCAs.

wijzewillem
This is Rich. Your question is a key one for LCA!. Direct product comparisons need to be done with rigor and review as per ISO standards, which do take time and money, so we don't a lot of those. We are much more likely to do "quick LCA (attributional)" to better understand the potential advantages or "hot spots" for a product to know how to improve or position it, doing the ISO-LCA if public claims are important to make. We strongly encourage and do these quick LCA for our internal work and understanding. Consequential LCA are best applied to policy or societal questions, which specific products are not likely to influence, so we use attributional approaches much more often. A "semi-consequential" LCA might be undertaken if we are looking a new product area that would compete with another new product (so no incumbent, with more-or-less known "footprints") or for projects where land use or land use change may be important.

Which industries and/or organizations do you consider to be ahead of the curve in terms of sustainability?

Beakersoverflowing
Hi Beakersorverflowing, this is Han. One important external validation about a company's sustainability performance is the Dow Jones Sustainability World Index. only the top 10% of 2500 global large cap companies can be selected on the DJSI world index. Dow has been on this index for 15 time, which ties the longest standing among chemical companies.

Which industries and/or organizations do you consider to be ahead of the curve in terms of sustainability?

Beakersoverflowing

This is Rich. Good question - it's great to find inspiration and ideas from others! The company that pops first into my mind is Unilever, with their Sustainable Living Plan. There are a lot of bold and interesting concepts there! I also think NGOs have a huge role to play - ones that use good science and can collaborate with companies to get things done. The Nature Conservancy and World Wildlife Fund come to mind here. There are others - but that's my quick answer.

As the healthcare field grows it certainly seems to be approaching unsustainable levels of resource consumption - most medical waste is certainly not recycled, as it would be risky for recycling workers to pick out bloody syringes and such just to harvest that little bit of plastic and steel.

What if any ways can we reduce the environmental impact of health care in the future?

chui101
This is Rich. A few years ago, when Amy Landis was at U. Pittsburgh, her research group did some LCA work on medical procedures. I don't know what they published, but their talks at conferences were always interesting, and helped put some numbers on opportunities (of course, saving lives is paramount).