Quantifying and Monetizing the Benefits of Aquaponics

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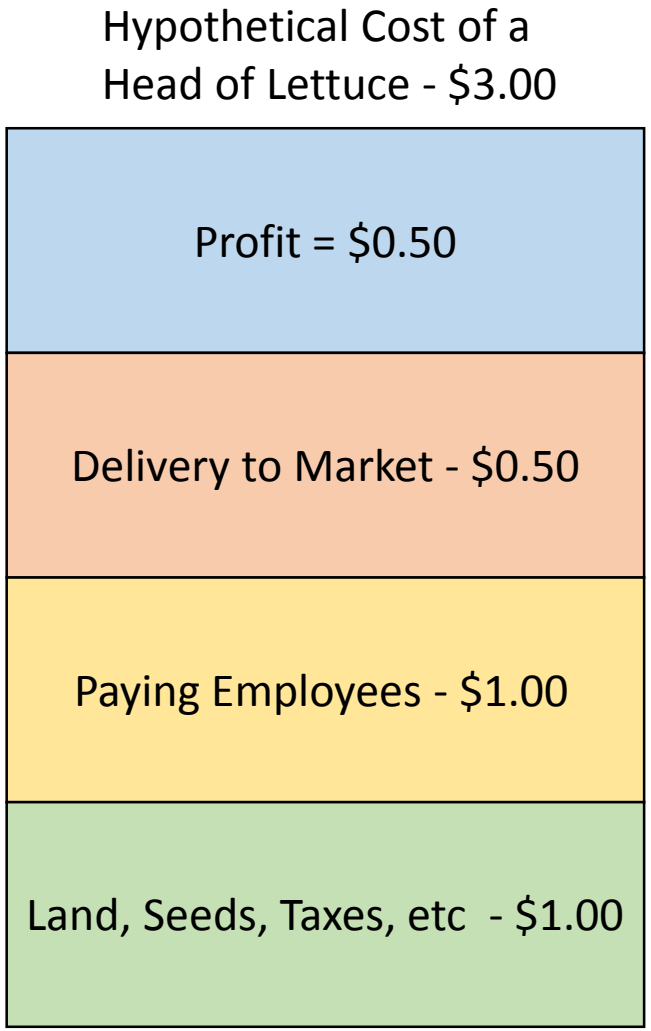
Quantifying and Monetizing the Benefits of Aquaponics

Goals of this presentation:

- Build a critical mass of aquaponic growers that understand:
  - how *True Cost Accounting* reveals the economic benefit of aquaponics
  - That the hidden costs of modern industrial agriculture are public problems that require public policy to address
- Galvanize aquaponic growers to begin educating the public, the media, and policy-makers about the economic benefits of aquaponics
- Start the campaign for local, state, and federal policy changes that help aquaponic growers monetize our benefits

Contents

Producers sell their products for a price that accounts for the cost of inputs and production, plus a profit margin.



$3.00

At the Market, a consumer pays $3.00 for this head of lettuce. The $3.00 pays for the production costs and inputs, plus some profit for the producer.

Flaw in the System

What if some of the costs of production aren't paid for? For example: what if some costs don't materialize until AFTER the consumer's purchase and consumption of the good? ….Uh-oh

Externalities, a technical name for "Hidden Costs"

"An externality is a consequence of an economic activity experienced by unrelated third parties; it can be either positive or negative."

http://www.investopedia.com/terms/e/externality.asp

Negative Externality Example

Pollution from a nearby factory can tarnish the surrounding environment and affect the health of nearby residents. This pollution will lead to increased healthcare costs, decreased property value, and other costs that are paid for by unrelated 3rd parties, rather than by the producer / consumer of the good that caused the pollution.

Positive Externality Example

When you pay for your own college degree you get a private benefit. But there are also benefits to the rest of society, such as a better economy and reduced crime rate. These factors are economically beneficial for society as a whole, even though they didn’t pay for your college degree.

Our Modern Agricultural System is LOADED with Hidden Costs

- Extreme Water Usage
- Carbon Emissions / Climate Change
- Pesticide Usage
- Antibiotic Usage
- Fertilizer Usage / Nutrient Runoff
- Soil Compaction and Erosion
- Excessive Land Use / Biodiversity Loss

“True Cost Accounting”

The process by which the full costs and benefits of different food and farming systems are identified, quantified and made transparent with the aim of ensuring that in future these are fully reflected in the cost of production for farmers.

Example #1 of a Hidden Cost in our Agricultural System
Fertilizer Runoff from Farms

Nitrogen and Phosphorus runoff from farm fertilizers is a major cause of pollution. “Both nitrogen and phosphorus feed algal blooms that block sunlight to underwater grasses and suck up life supporting oxygen when they die and decompose. These resulting "dead zones" of low or no oxygen can stress and even kill fish and shellfish. Algal blooms can also trigger spikes in pH levels, stressing fish, and create conditions that spur the growth of parasites. Toxic algae, such as some blue-green algae (cyanobacteria), can sicken people, as well, but animals are especially susceptible. These toxins affect the animal's liver and nervous system, and can result in death.”
(http://www.cbf.org/about-the-bay/issues/dead-zones/nitrogen-phosphorus)

The largest source of pollution to the Bay comes from agricultural runoff, which contributes roughly 40 percent of the nitrogen and 50 percent of the phosphorus entering the Chesapeake Bay.
(http://www.dailypress.com/news/science/dp-nws-bay-dead-zone-20160615-story.html)

Two examples of the hidden costs of farm fertilizer runoff

$82 million/yr

The National Oceanic and Atmospheric Administration estimates that the dead zone in the Gulf of Mexico costs U.S. seafood and tourism industries $82 million a year.
(http://www.nature.org/ourinitiatives/regions/northamerica/areas/gulfofmexico/explore/gulf-of-mexico-dead-zone.xml)

$18.7 BILLION Total

The Chesapeake Bay Commission estimates that it will cost $18.7 Billion for an eight year effort to completely clean the Bay.
(http://www.chesbay.us/Publications/C2Kfunding.pdf)

We all pay for the hidden costs of industrial agriculture

- Government taxation and spending – like the money the U.S. spends to address drought or climate change
- Lost private value – like a home next to a CAFO
- Incidental increased costs – like higher healthcare costs from the long term effects of pesticide use
- Lost economic value – like the U.S. seafood industry because of fertilizer runoff

Union of Concerned Scientists Statement on Hidden Costs

Our industrialized food and agriculture system comes with steep costs, many of which are picked up by taxpayers, rural communities, farmers themselves, other business sectors, and future generations. When we include these “externalities” in our reckoning, we can see that this system is not a cost-effective, healthful, or sustainable way to produce the food we need.

http://www.ucsusa.org/food_and_agriculture/our-failing-food-system/industrial-agriculture/hidden-costs-of-industrial.html#.WCEBrS0rKpo

Aquaponics can produce food with far fewer hidden costs than modern industrial agriculture

Problem from Food System	Aquaponics
Carbon emissions, climate change	Aquaponics does not require soil, also it can be practiced in urban areas, cutting down on transportation fuel; Aquaponics also does not require synthetic fertilizers produced with petrochemicals
Fertilizer runoff, aquatic dead zones	Aquaponics is usually a closed-loop system, no fertilizer runoff
Pesticide use, health problems	Aquaponics CANNOT use pesticides, it would harm the fish
Antibiotic resistance	Aquaponics CANNOT use antibiotics, it would kill the biofilter
Drought, water scarcity	Aquaponics uses 90% less water than traditional soil agriculture
Excessive land use, biodiversity loss, soil erosion and compaction	Aquaponics can grow more densely, and in urban areas, cutting down on land needed to produce food

The BIG QUESTION:
If Aquaponics is so efficient, why is it so difficult to be commercially successful?

"The commercial viability of aquaponics is likely the hottest contested topic on most aquaponic forums today and is the million dollar question that everyone wants answered." *(Gina Cavaliero, Green Acre Aquaponics)*

There is a lack of quantitative research to support the development of economically feasible aquaponics systems. Although many studies have addressed some scientific aspects, there has been limited focus on commercial implementation. *(Goddek et al, 2014)*

While backyard aquaponics has become more common in recent years as a way to supply vegetables and fish for household consumption, several commercial-scale aquaponics farms have started operations in Hawaii. Yet, the economic feasibility of commercial scale operations is unclear. There is some anecdotal evidence regarding the successes and failures of commercial scale aquaponics operations; however, there are only a few formal economic analyses of largescale operations and, to the authors' knowledge, there are no formal studies on existing commercial aquaponic farms. *(Tokunaga, et al 2013)*

Example of Capturing ONE Hidden Cost

$82 million / year economic loss to the U.S. seafood industry which is largely caused by farm fertilizer runoff.

Hypothetical Cost of a Head of Lettuce Accounting for the Hidden Costs of Fertilizer Runoff to the Seafood Industry

$3.02

Cost of Nutrient Runoff per Head = $0.02
Profit = $0.50
Delivery to Market - $0.50
Paying Employees - $1.00
Land, Seeds, Taxes, etc - $1.00

True Cost Accounting Comparison of a Head of Lettuce

(Assuming the same $3.00 cost of lettuce production for the sake of illustration)

$3.25 Aquaponics Lettuce

$4.00 Industrial Agriculture Lettuce

If we use True Cost Accounting we see that the aquaponics lettuce is cheaper because it has lower hidden costs

	Aquaponics Lettuce	**Industrial Agriculture Lettuce**
Price WITHOUT accounting for hidden costs	$3.00	$3.00
Price WITH accounting for hidden costs	$3.25	$4.00

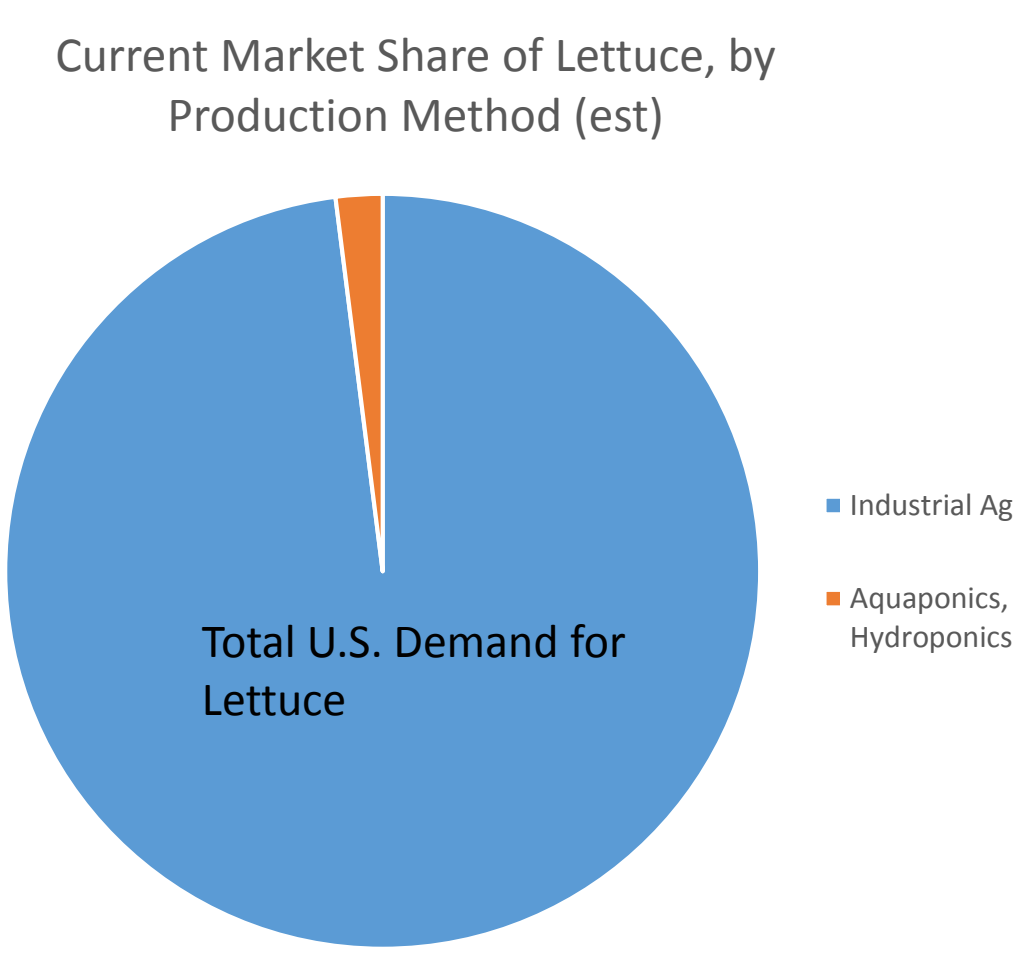
	Aquaponics Lettuce	Industrial Agriculture Lettuce
Price WITHOUT accounting for hidden costs	$3.00	$3.00
Price WITH accounting for hidden costs	$3.25	$4.00
Implicit Subsidy	$0.25	$1.00

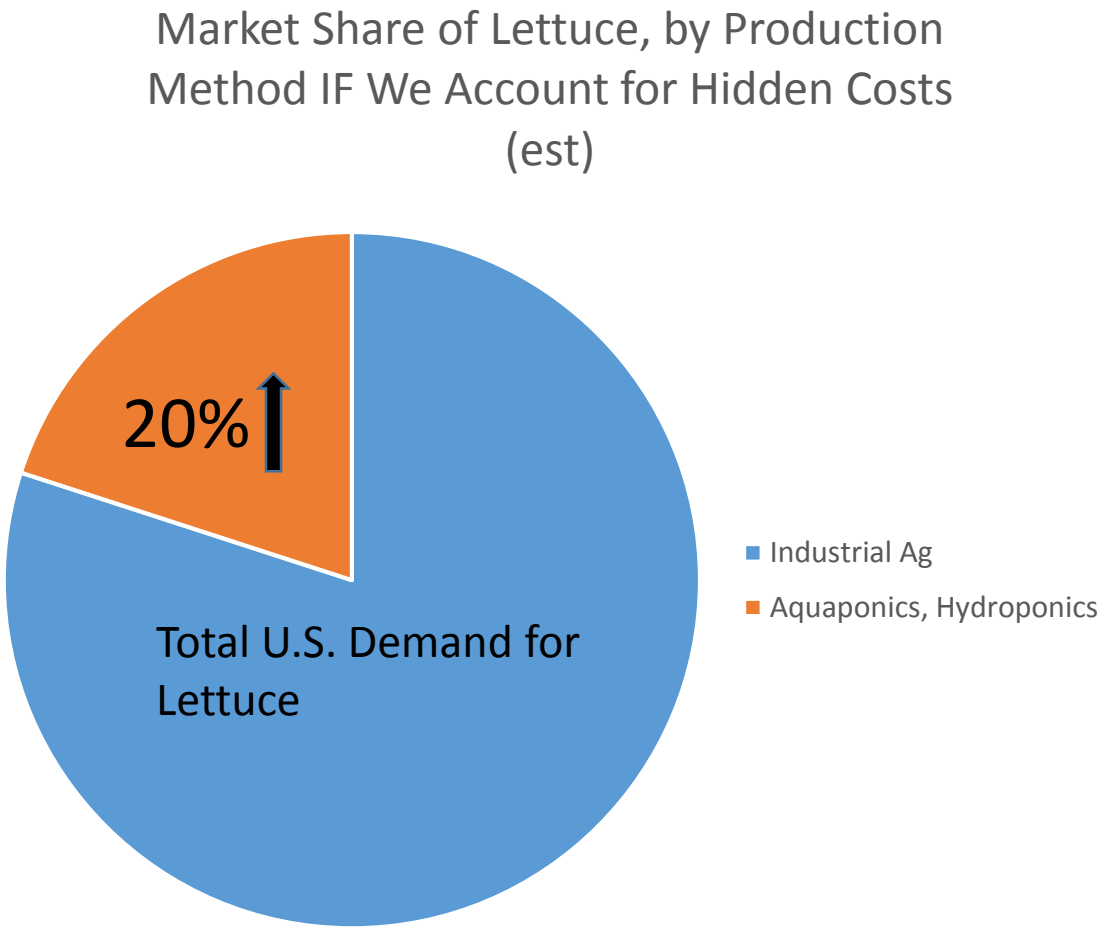
Both aquaponics and industrial agriculture will have implicit subsidies for hidden costs that are not accounted for. But:

- The industrial agriculture producer gets a $1.00 subsidy
- The aquaponics producer competes in the same market, but with only a $0.25 subsidy!!!

Economic Theory – The Invisible Hand

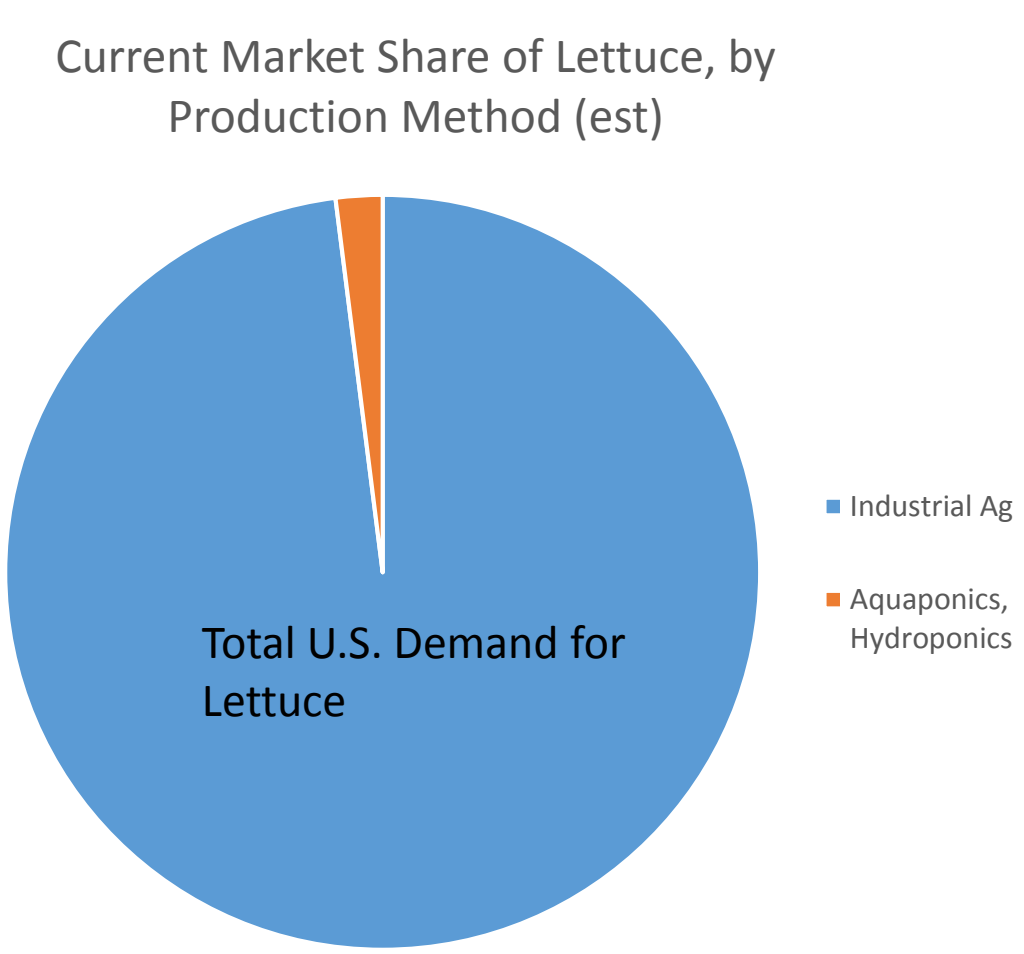
If we account for these hidden costs then producers and consumers will naturally be incentivized to more sustainable produce… because it will cost less! More and more of our production would switch to sustainable methods and the market share for aquaponic and other sustainable produce would rise.

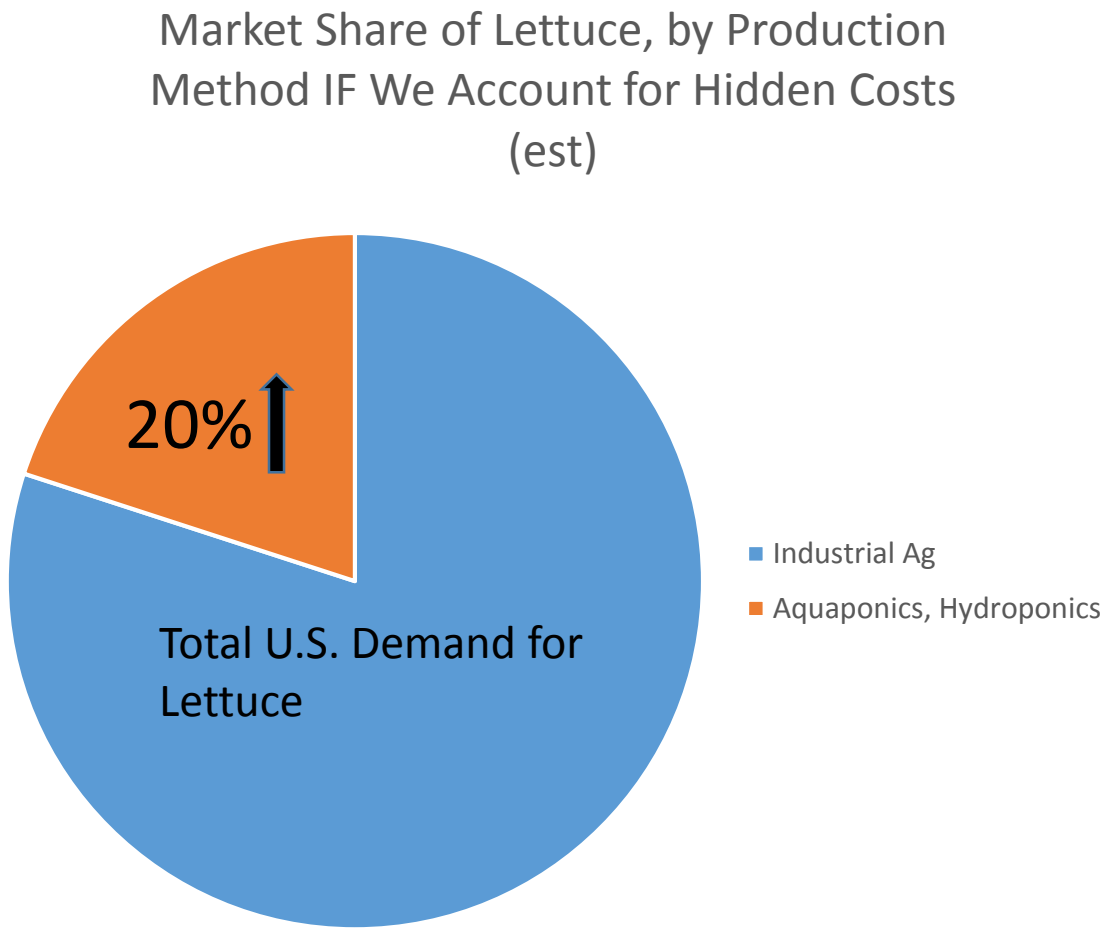




Is California charging an appropriate price for water in the middle of the drought? Probably Not…

If California does charge more for water, aquaponics production becomes more and more commercially attractive. The market would begin to transition into more aquaponics and less industrial ag because it is so water inefficient.





The BIG QUESTION: If Aquaponics is so efficient, why is it so difficult to be commercially successful?

The BIG ANSWER: Because industrial agriculture benefits from a much larger implicit subsidy than aquaponics for hidden costs that we don’t force producers to pay. If we accounted for these hidden costs then aquaponics would capitalize on its efficiency.

You might be saying to yourself:
“Hey, but won’t ALL food be more expensive this way?”

YES, the prices at the register will be higher. But the taxes, the healthcare costs, and the economic loss will be lower.

The point is: SOMEONE is going to be left holding the bag for these costs whether we account for them on the front end or on the back end. True Cost Accounting just ensures it is the producers and consumers of the good - rather than unrelated 3rd parties – that pay these costs.

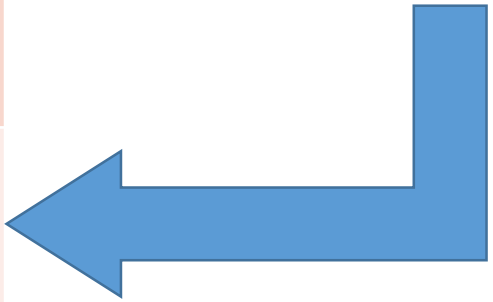
PLUS, usually these hidden costs are more expensive to handle retroactively, then to properly manage beforehand.

For Example – enacting fertilizer runoff policies decades ago would be cheaper than spending $18.7 BILLION now to clean up the Chesapeake Bay. But because we did not account for the hidden costs, producers were incentivized to keep using practices that polluted the Bay.

How Do We Monetize Our Benefits?

	Aquaponics Lettuce	Industrial Agriculture Lettuce
Price WITHOUT accounting for hidden costs	$3.00	$3.00
Price WITH accounting for hidden costs	$3.25	$4.00

How does aquaponics capture this $0.75 benefit?



Bad News: Monetizing aquaponics' benefits to gain commercial success is difficult. By nature, capturing hidden costs requires public policy. That is probably why these became hidden costs in the first place!

Methods to Account for Hidden Costs - Fertilizer Runoff Example

Government Taxes – Put a tax on fertilizer

Government Regulations – Outlaw fertilizer use

Government Subsidies – Grants to producers that don’t use fertilizers

Political Philosophy

- Whether you are a liberal or a conservative you should support policies to account for hidden costs. These policies only ensure that those that create costs pay for them

- Even Conservative economic theory dictates we should account for these costs so that the market will direct behavior accordingly to reduce total costs and maximize utility

There is nothing inherently wrong with water usage, carbon usage, pesticide usage, antibiotic usage etc, but if you're going to do it, YOU NEED TO PAY FOR IT YOURSELF!

Remember: somebody is going to be paying for these costs eventually!

Good News – We already account for some hidden costs, and there are powerful voices suggesting we do it more

Examples of public policies already in place that address hidden costs:

- Banning toxic sprays
- Fuel Taxes
- Subsidies for Organic farming

Union of Concerned Scientists Calls for Policy Changes to Shift Away from Industrial Agriculture

Given our urgent need for profitable, ecologically sustainable farms and ranches, we need to do a better job of investing in agroecology. And USDA leadership and support is critical because the private sector largely lacks a profit incentive to invest in this area.

http://www.ucsusa.org/food-agriculture/advance-sustainable-agriculture/counting-on-agroecology#.WCECaS0rKpo

In this 2016 report, Dr. Harpinder Sandhu uses true cost accounting to assess four agricultural production systems.

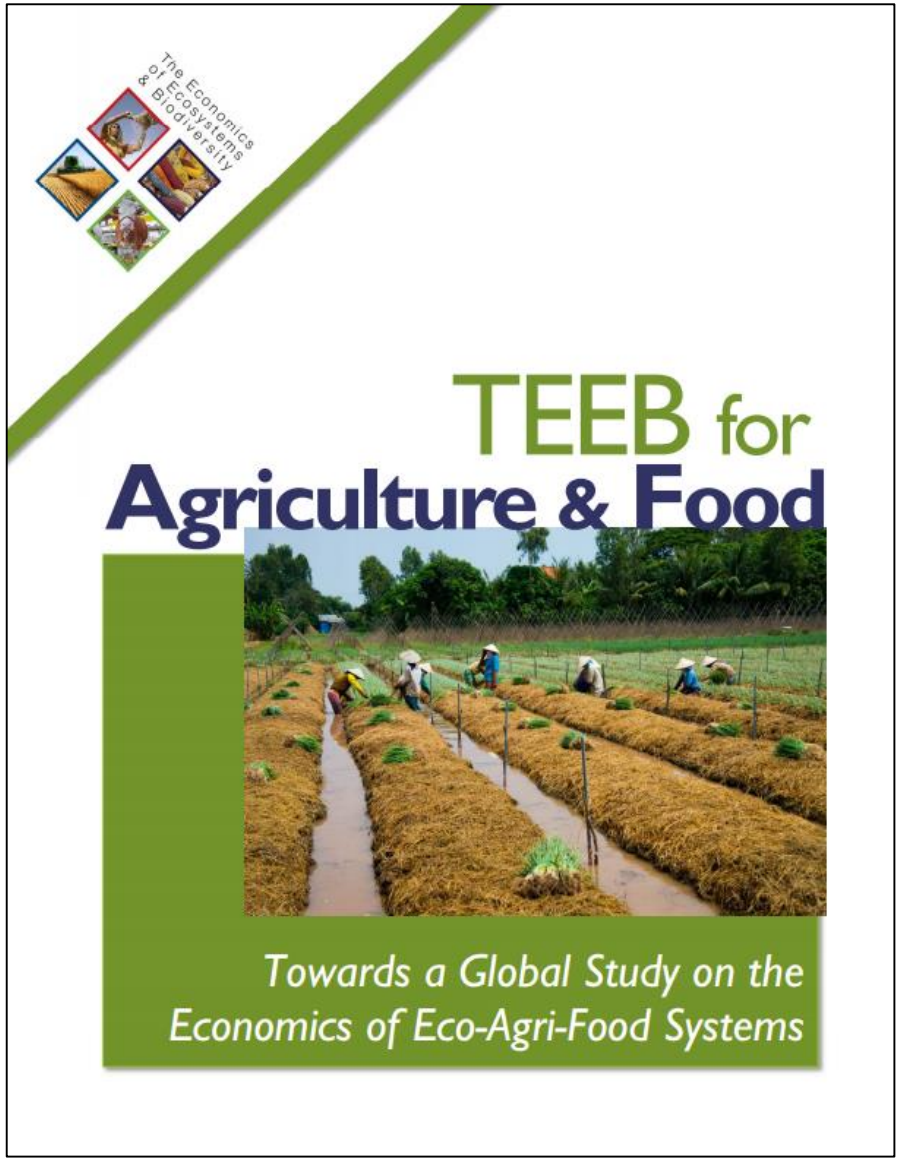
We should support a true cost accounting analysis of aquaponics production!

http://sustainablefoodtrust.org/wp-content/uploads/2013/04/Harpinder-Final.pdf

“TEEB”, part of the United Nations Environment Program

“The Economics of Ecosystems and Biodiversity (TEEB) is a global initiative focused on “making nature’s values visible”. Its principal objective is to mainstream the values of biodiversity and ecosystem services into decision-making at all levels. It aims to achieve this goal by following a structured approach to valuation that helps decision-makers *recognize* the wide range of benefits provided by ecosystems and biodiversity, *demonstrate* their values in economic terms and, where appropriate, suggest how to *capture* those values in decision-making.”

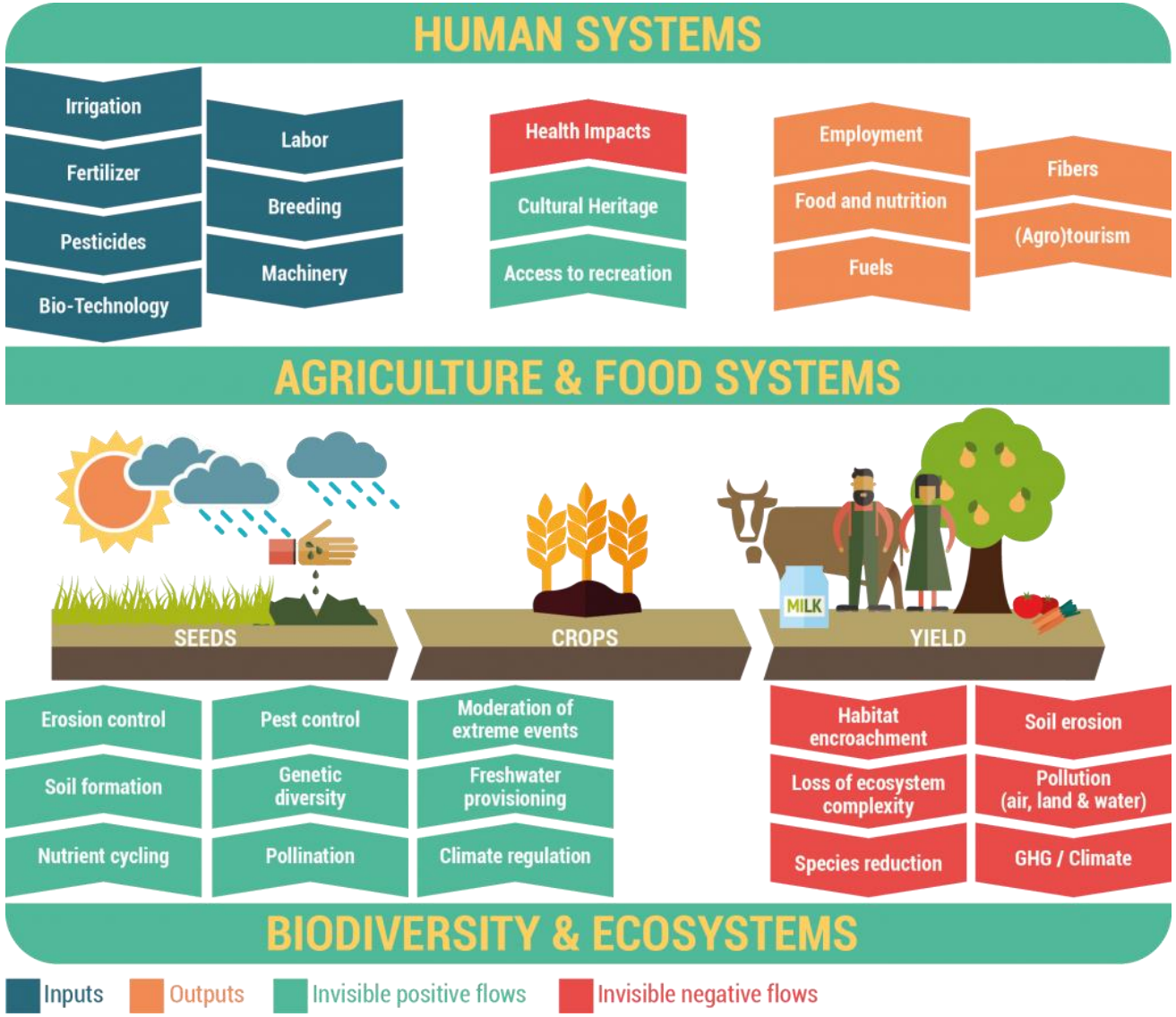
http://www.teebweb.org/agriculture-and-food/



TEEB Evaluation Matrix

Visible and Invisible flows \ Value-Chain Stages	Production (and associated waste)			Processing and Distribution (and associated waste)			Consumption (and associated waste)
	Landscape	Infrastructure and Manufacturing	Farm	Wholesale	Food and Beverage	Retail	Industry/Household/ Hospitality
Captured by System of National Accounts (SNA) (Profits, Wages, Taxes net of Subsidies, etc.)							
Provisioning (Materials, Energy, etc.)							
Regulation and maintenance (Soil, Water, Habitat for biodiversity, etc.)							
Cultural (Heritage, Recreation, etc.)							
Health (Nutrition, Diseases, Antibiotic resistance, etc.)							
Pollution (Nitrates, Pesticides, Heavy metals, etc.)							
Emissions (CO_2, CH_4, etc.)							
Social values (Food security, Gender equality, etc.)							
Risks and uncertainties (Resilience, Health, etc.)							

TEEB diagram of the cost and benefit flows of the agriculture and food system



https://www.google.com/search?q=teeb+agrifood&safe=off&espv=2&biw=1396&bih=669&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiy7avxpo3QAhUD2SYKHZdhBokQ_AUIBygC#imgrc=Qm7I6WJ9hixv1M%3A

Learning from the Organic Movement

The Organics Industry Has Successfully Influenced Public Policy to Capture Some of its Benefits in the Farm Bill

"'Organic food was moving into the mainstream, but not in terms of federal support,' says Bob Snowcroft, founder and former director of the Organic Farming and Research Foundation. 'Our strategy was simple. We wanted our **fair share** of research dollars and other production support from national Farm Bill programs.'"

"An organic coalition successfully lobbied for $78 million in research, $22 million to share the costs of organic certification fees, and $5 million for marketing."
(Daniel Imhoff, Food Fight, A Citizen's Guide to the Next Farm Bill, 2012)

Opportunity: The 2018 Farm Bill

Every 5 years the federal government passes the Farm Bill. It spends hundreds of billions of dollars, a large part of which are unnecessary subsidies to large farmers. We need to fight for aquaponics' **fair share**!

Example:
Corn farmers received $2 Billion in direct federal payments in 2007, a year in which they experienced record yields and strong prices. Most of this money went to the top 10% of largest operations.
(Daniel Imhoff, Food Fight, A Citizen's Guide to the Next Farm Bill, 2012)

The federal government is going to be spending our tax dollars in the 2018 Farm Bill, we should fight for our **fair share**!

Conclusion:

- Our economic system currently doesn't account for hidden costs, which is a big disadvantage for aquaponics

- We need to fight for our **fair share** with local, state, and federal policies that allow us to monetize our benefits

- We need to get ready for the 2018 Farm Bill!