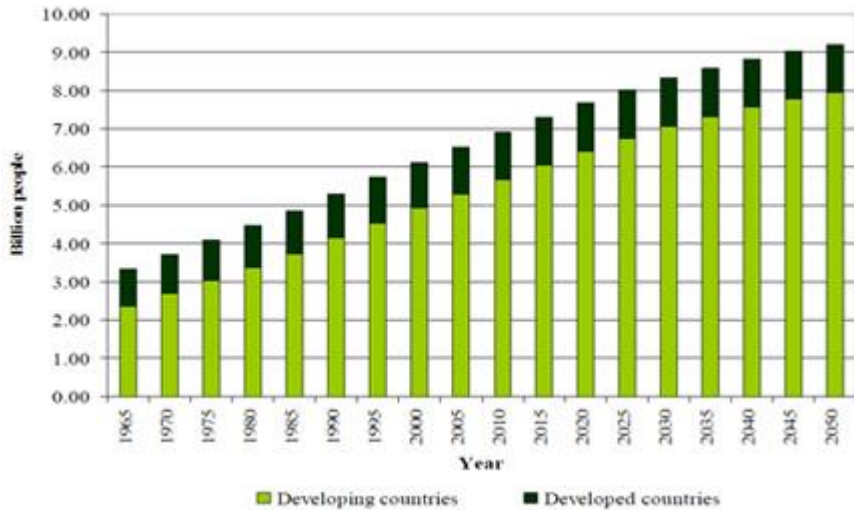


Advancing Water Quality Through Ag Conservation



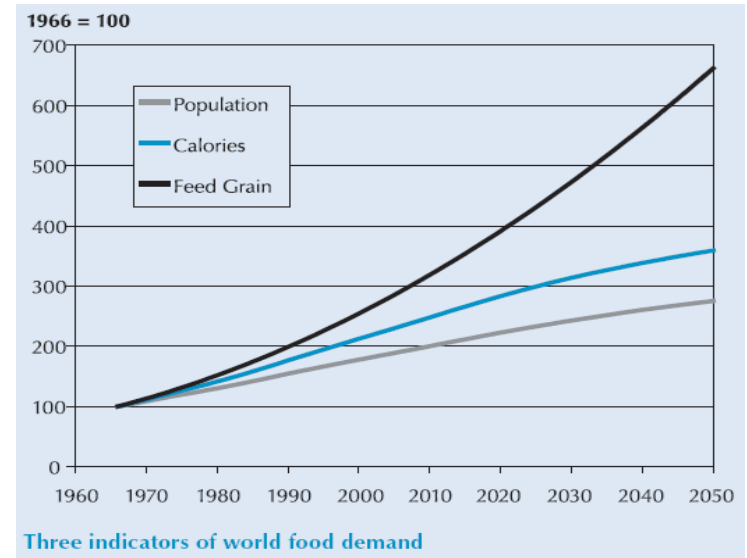
Drivers of Food Demand

World Population 1965 - 2050



Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat 2017

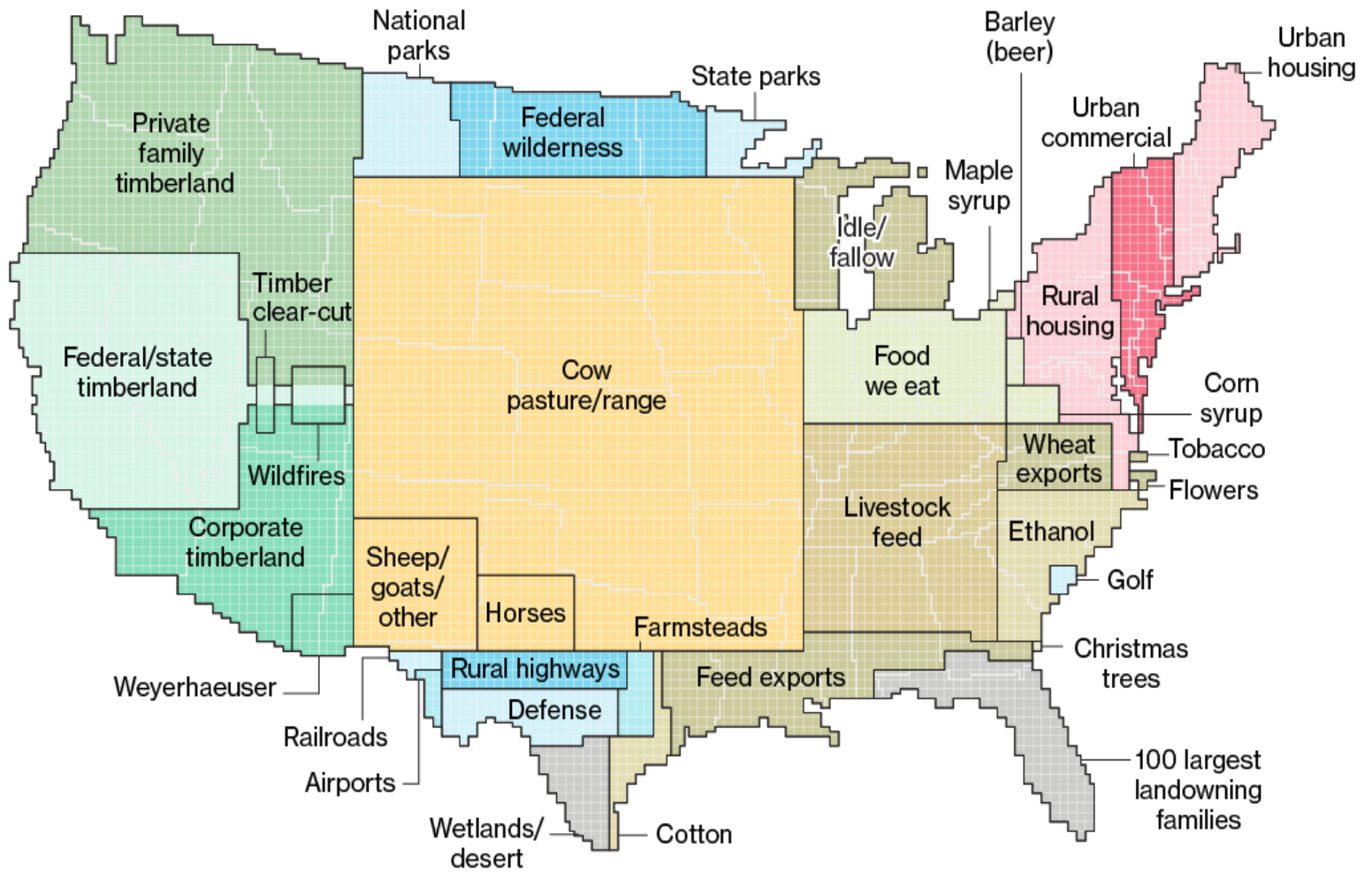
Factors Contributing to Increased Food Demand



Source: Iowa State; Bruce A. Babcock



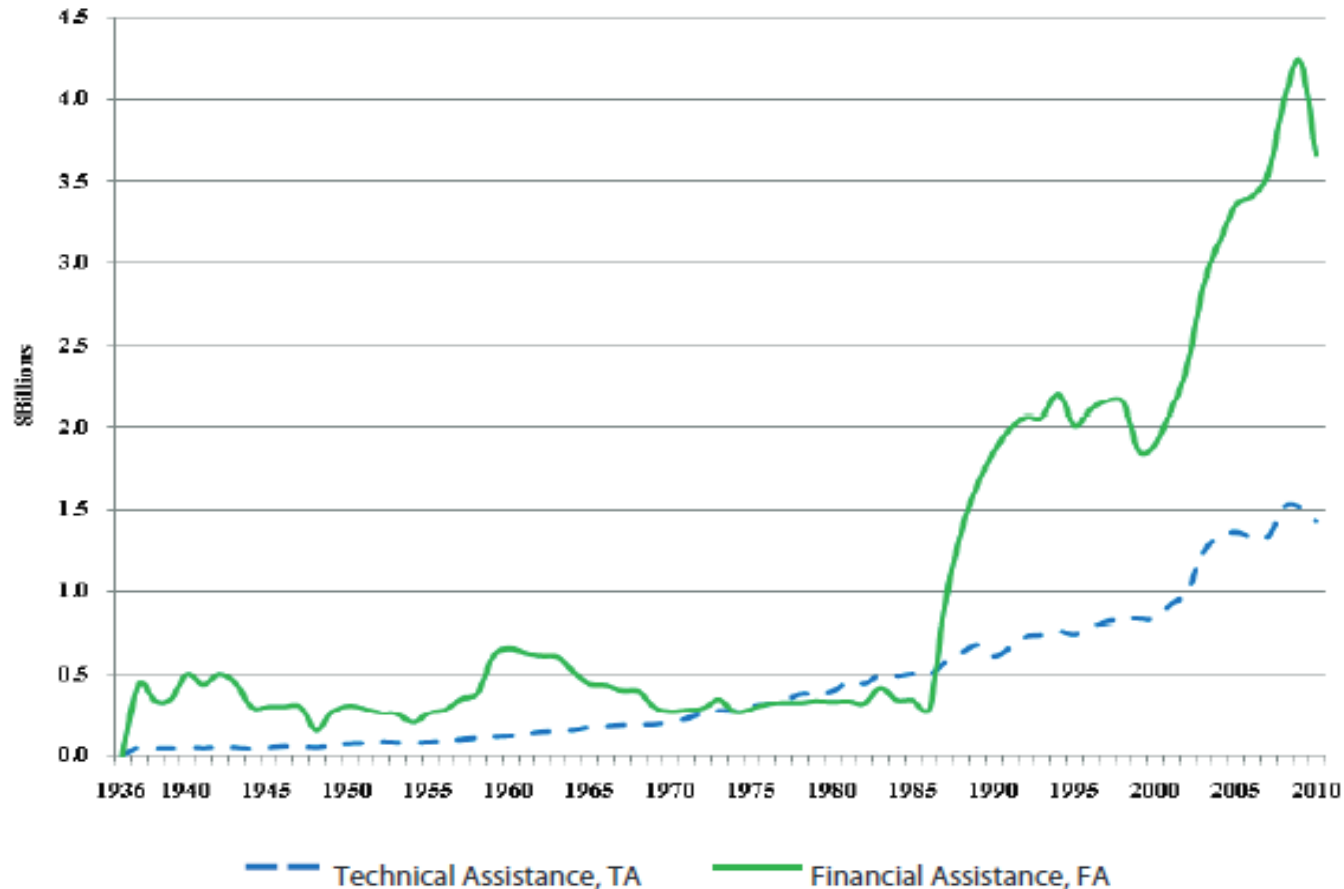
US Land Use



Source: www.bloomberg.com/graphics/2018-us-land-use/img/2018-us-land-use



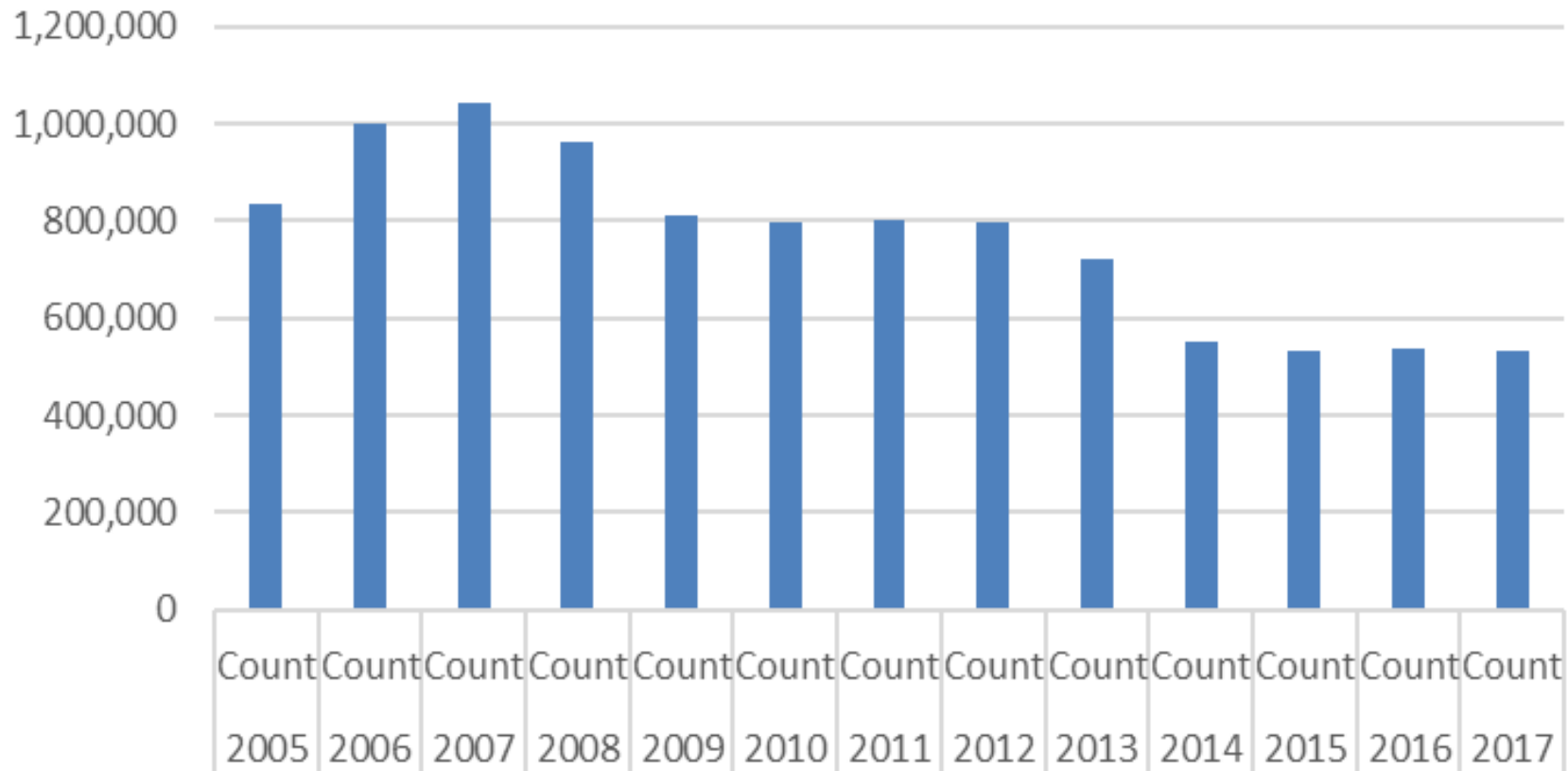
Figure 1. USDA Soil and Water Conservation Expenditures for TA and FA, FY 1936–2010, in Historical Dollars



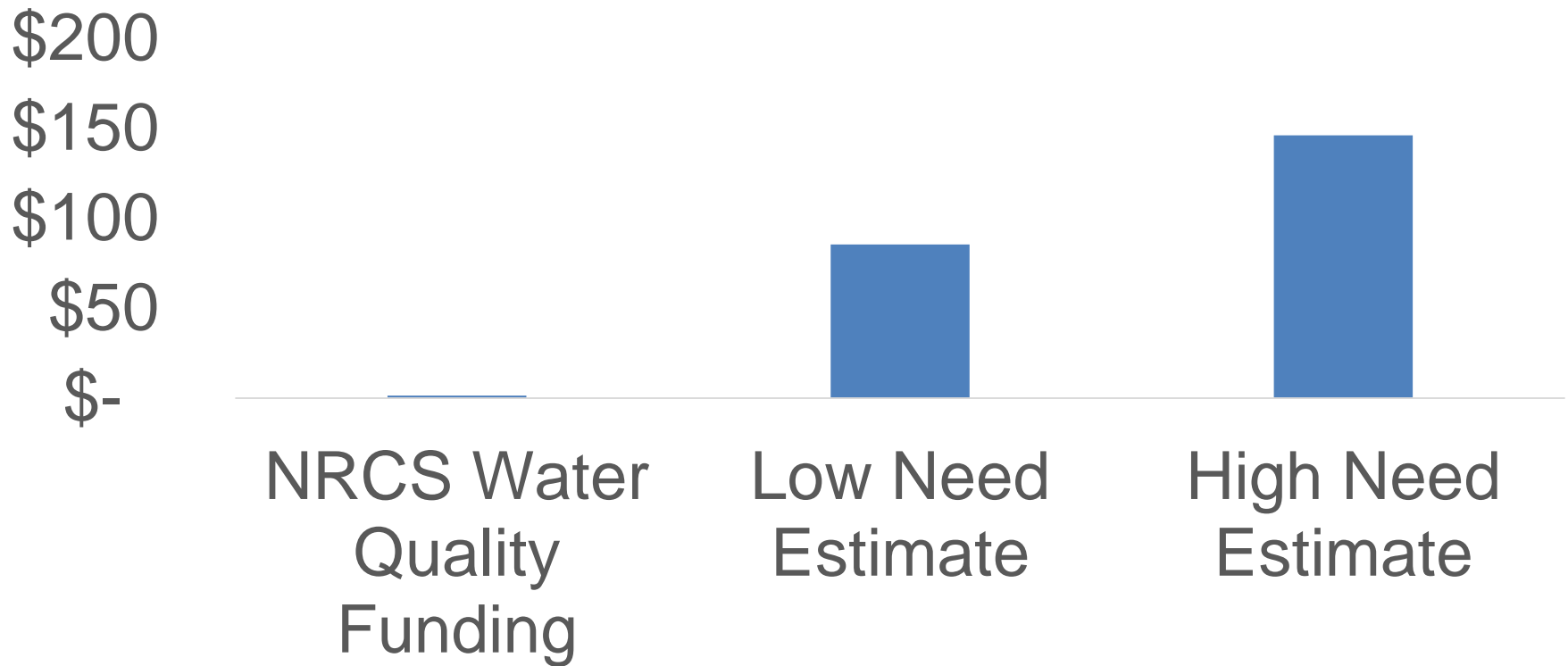
Note: Total Assistance = \$110 billion
Total TA = \$32.7 billion (30%)
Total FA = \$77.3 billion (70%)



Number of Conservation Practices Treating Water Quality



Water Quality Funding Gap In Billions of \$



Shift to Performance Based Conservation

1. We spend billions of dollars a year in federal funds to invest in ag conservation
2. Those investments are principally driven by where farmers sign up not by conservation priorities
3. The incentives to farmers do not cover full costs. Typically not sufficient to sustain
 - Operating
 - Duration



Impediments to Overcome 1

We need **decision support system** to invest where we think we get a higher conservation return on investment e-ROI

- ✓ At the farm level
- ✓ At the conservation investment scale
- ✓ At the national level



Impediments to Overcome 2

We need to better align the incentives:

- ✓ Farmers will finance on farm benefit – but what about off farm benefits for things like water quality?
- ✓ Do incentives cover the real costs not just of building but also operating the conservation practice?
- ✓ Incentive needs to cover the term of the conservation practice



Impediments to Overcome 3

We need science to advance our understanding of costs and **environmental ROI (e-ROI)**

- ✓ We can not even tell you the environmental benefit of where we have spent billions – why do we think that free ride will continue?
- ✓ We can target areas where conservation is more effective.
- ✓ We need to track that implementation and outcomes in a way that protects farmer privacy but advances the public trust
- ✓ **We have not developed technologies to assess conservation and serve as planning tools**



Conservation Practice Effectiveness and Cost

Practice	\$ ha ⁻¹ y ⁻¹		\$ kg N ⁻¹ reduction		\$ kg P ⁻¹ reduction	
	IA	IL	IA	IL	IA	IL
Constructed Wetlands	37.10	151	0.60	1.80	–	–
Buffers	571	726	0.90	0.70	6.40	5.40
Cover Crops	111 to 121	71.70	2.70	1.50 to 5.00	27.20 to 68.00	11.10 to 59.20
Land Retirement	474	–	4.10	–	54.40	–
Controlled Drainage	24.70	–	0.60	–	–	–
Bioreactor	24.70	42.00	0.40	1.00	–	–

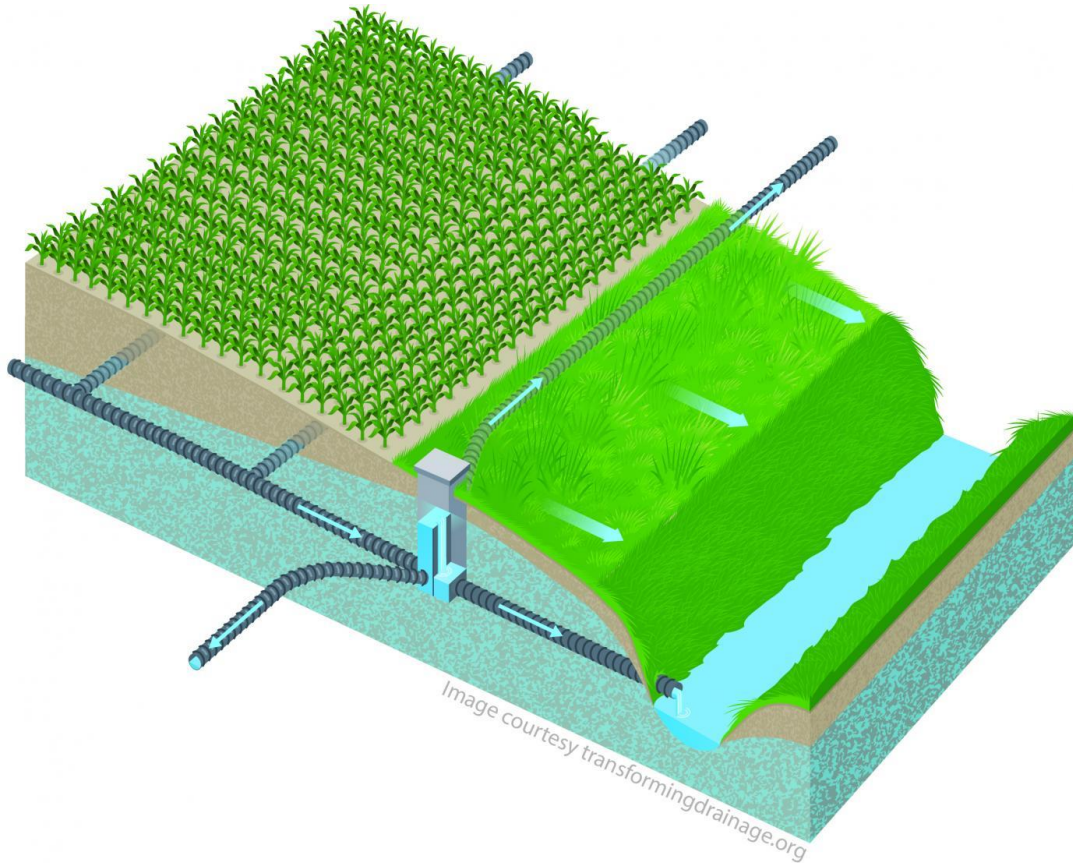
Christianson et al:

<https://www.sciencedirect.com/science/article/pii/S0301479717311271>



Example of New Research

Saturated Buffer



Highly Scalable

- Treat up to 9.5 million acres Midwest

Very Low Cost

- \$3 - \$4 K to install

Very high e-ROI

- 80 acre field and operate for 20 years cost would be less than >\$0.75/lb

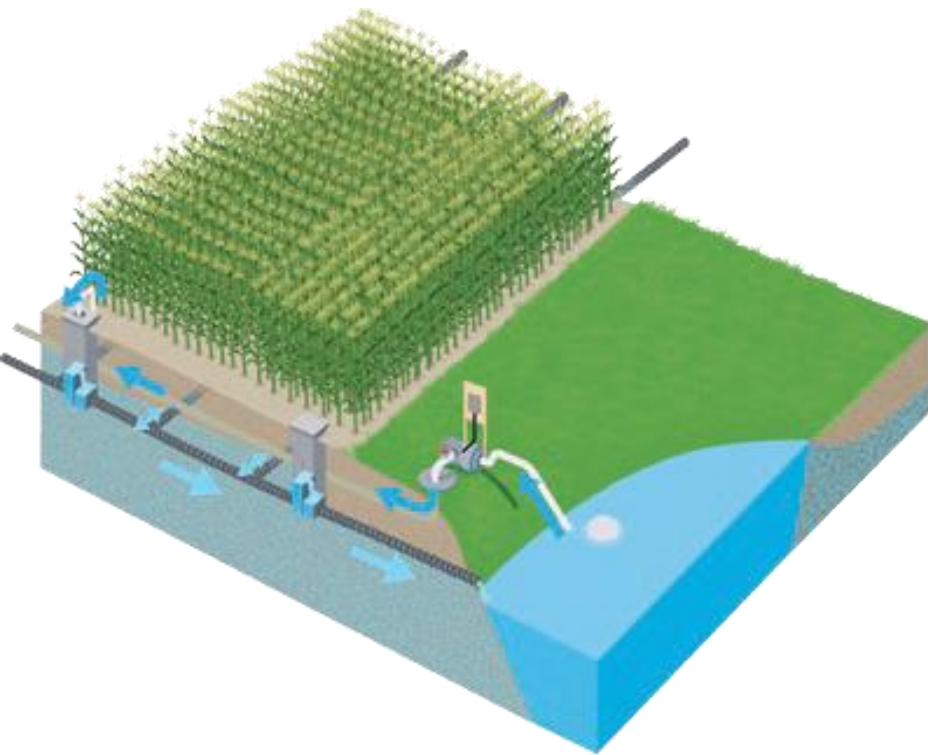
Note Saturated Buffer about 10X more Efficient than Conventional Buffer

See

<http://dl.sciencesocieties.org/publications/acl/pdfs/4/1/180059>



Coming Technology – Subirrigation and Reuse



Corn Response to Drainage (DO) and Subirrigation (DSI) (2002-16)

Year(s) and Environment	Yield increase		Gross margin	
	DO 20'	DSI 20'	DO 20'	DSI 20'
	---Bu/acre---		----- \$/acre -----	
14: Dry-Wet	-4	-12	-16	-50
06,16: Dry-Moderate	15	33	66	238
02,05,12,13: Wet-Dry	14	70	236	1,180
03,07: Wet-Moderate	26	56	144	311
04,08-11,15: Wet-Wet	43	36	1,054	877
Average (bu/a) & Total (\$)	26	50	\$1,484	\$2,556

Kelly Nelson, Agronomy Professor, Division
of Plant Sciences University of Missouri



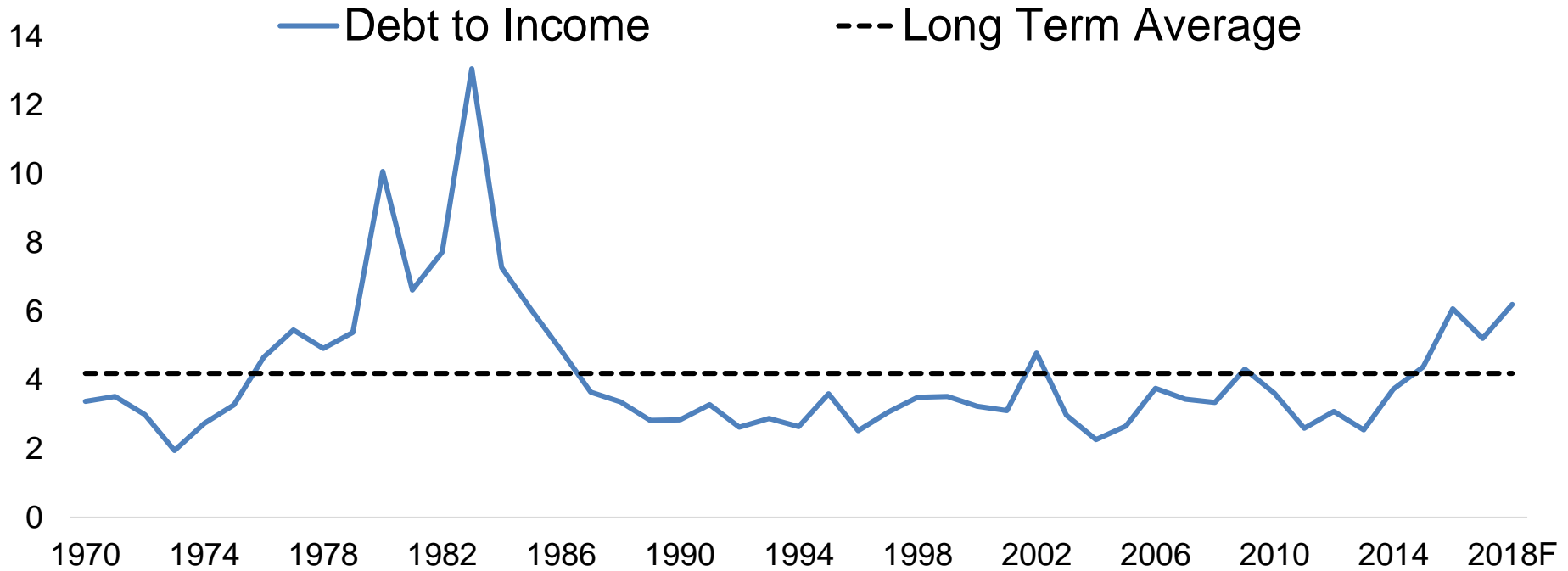
We Need to Create New Funding Sources

We need to engage non traditional funding sources

- Markets
- Insurance
- Lenders – Public and Private
- Consumers
 - Organics getting premium
 - Why not sustainables ➤ regenerative?
- Point source
- MS4
- Flood Reduction



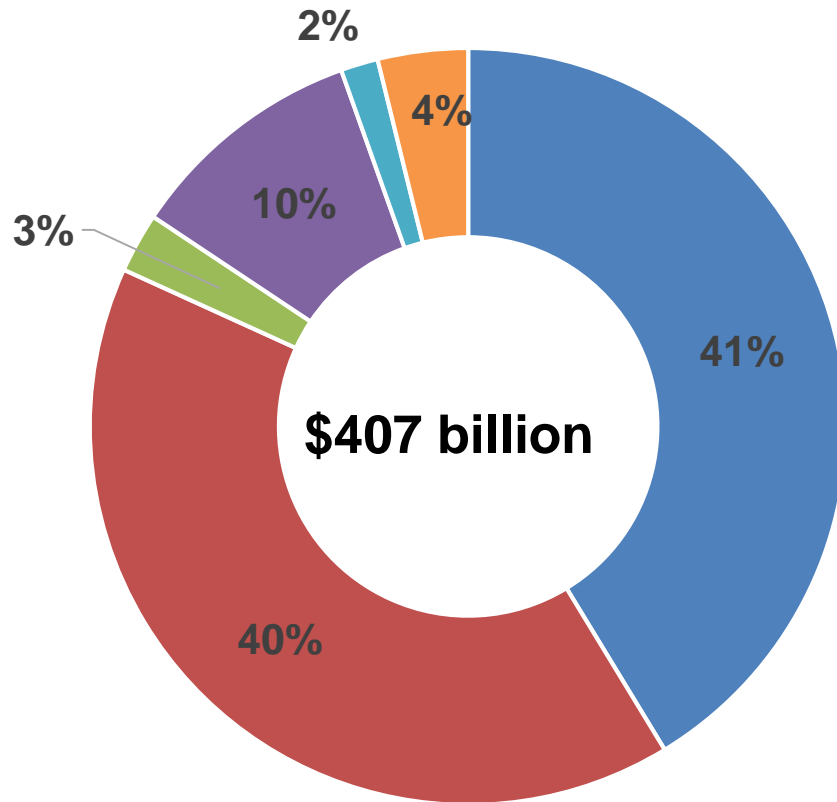
Farm Sector Debt to Income Ratio



Source: USDA



Distribution of Agricultural Debt by Lender



- Commercial Banks
- Farm Credit System
- Farm Service Agency
- Individuals and others
- Farmer Mac
- Life Insurance Companies

Source: USDA



Examples of Additional Funding Mechanisms

Water quality trading

There are many initiatives but no scale.

Carbon monetization

Still difficult science with purported success in grasslands

Investment funds

A number of funds have been launched to introduce a conservation element into farming operations, but no scale yet.

Pilot project support

There have been many pilot project ideas, like the NRCS Conservation Finance Innovation Grant program, but no project has moved to the investable stage.

Regulation and policy

A non-starter with farmers as social and political reality.



Key Impediments To Diversity Funding

1. Document environmental performance
 - We do a great job counting acres and linear feet
 - We fail to document effect on water quality
2. Get out of our ghetto
 - We are great talking to ourselves
 - We are not talking to the finance community
3. Align the incentives
 - Farmers will invest for on farm benefits
 - We need to finance off farm benefits – i.e. water quality



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