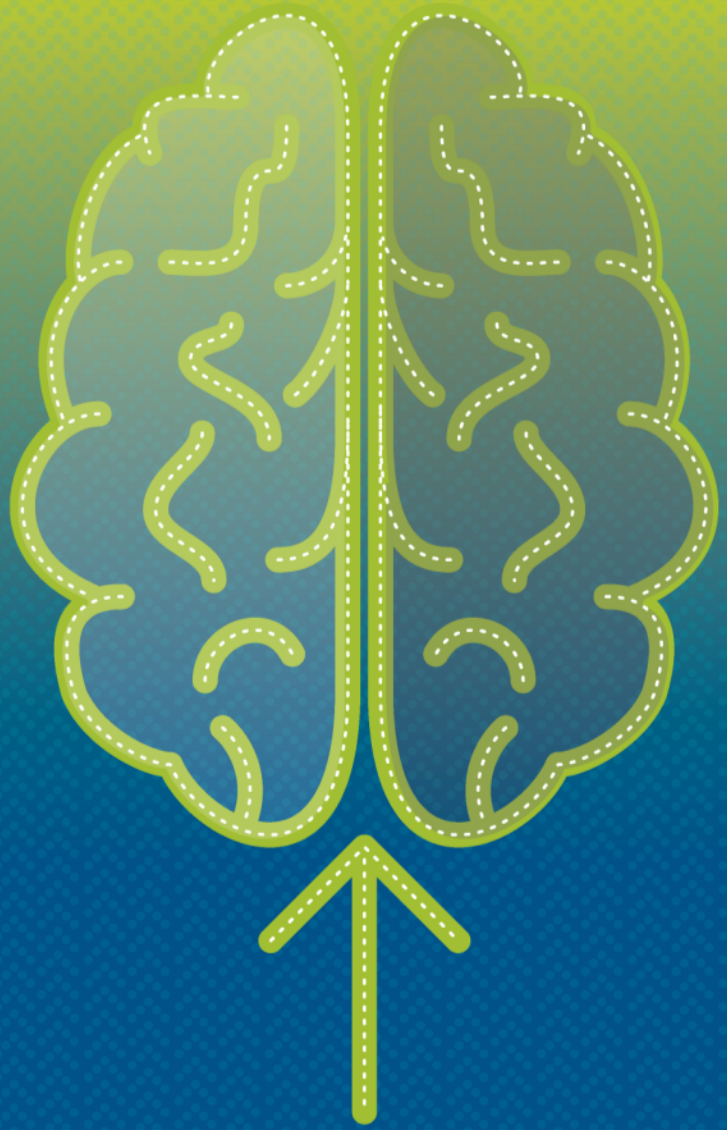
World Class. Face to Face.



think fresh


INNOVATORS
inspiring + exploring + transforming

green from the ground up

Cultivating a fresh approach to sustainable agriculture

FEATURING

Chad Kruger, Interim Director,
Center for Sustaining Agriculture and Natural Resources

Lynne Carpenter-Boggs, Research Leader for
Biologically Intensive and Organic Agriculture (BIOAg),
Center for Sustaining Agriculture and Natural Resources

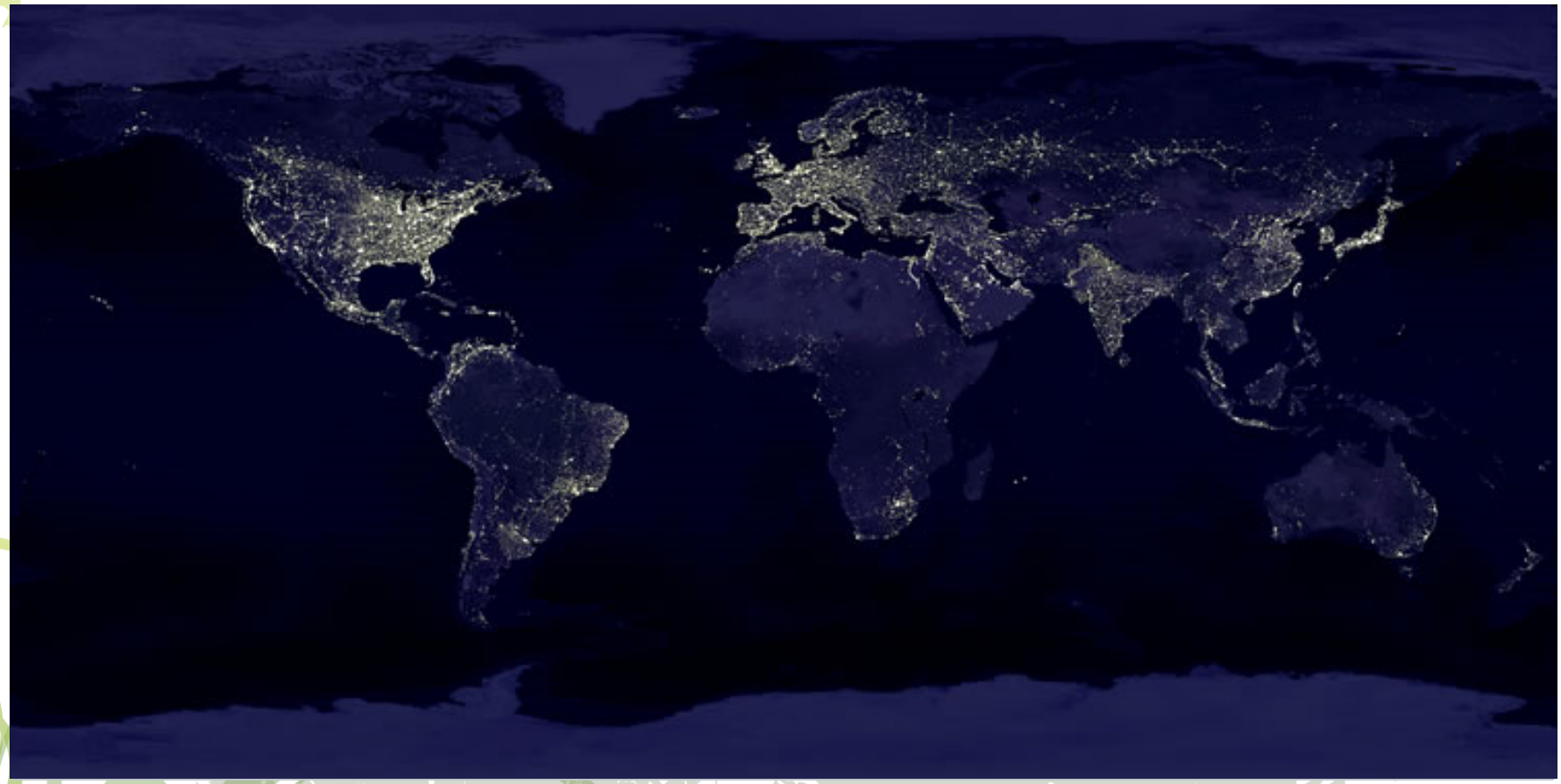
May 26, 2010
Seattle

green from the ground up

Cultivating a fresh approach to sustainable agriculture

FEATURING | **Chad Kruger**, Interim Director,
Center for Sustaining Agriculture and Natural Resources

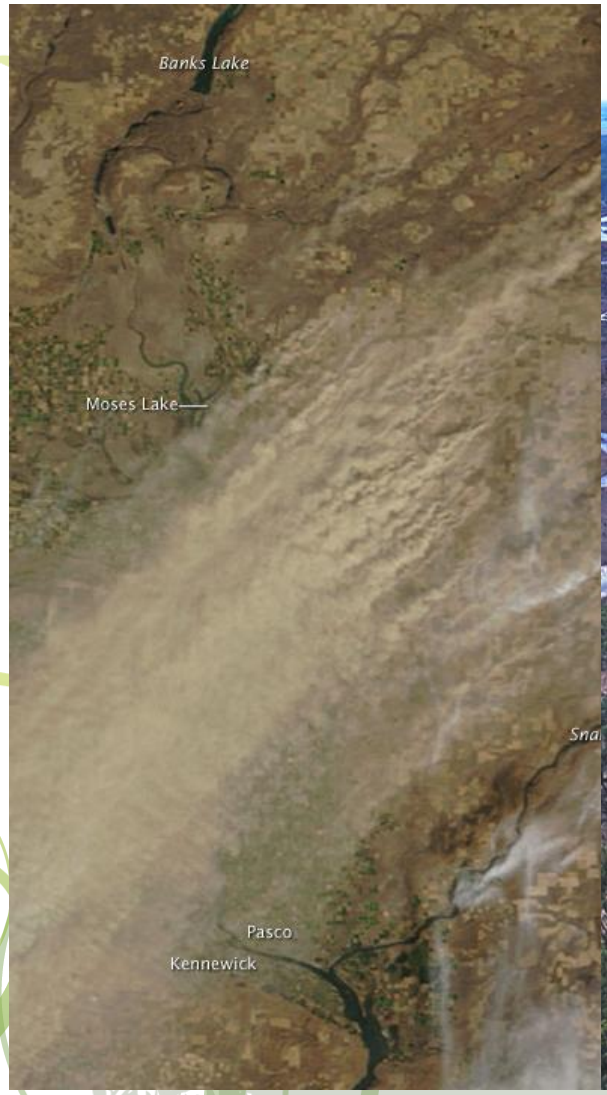
Human Consumption of Global Net Primary Productivity



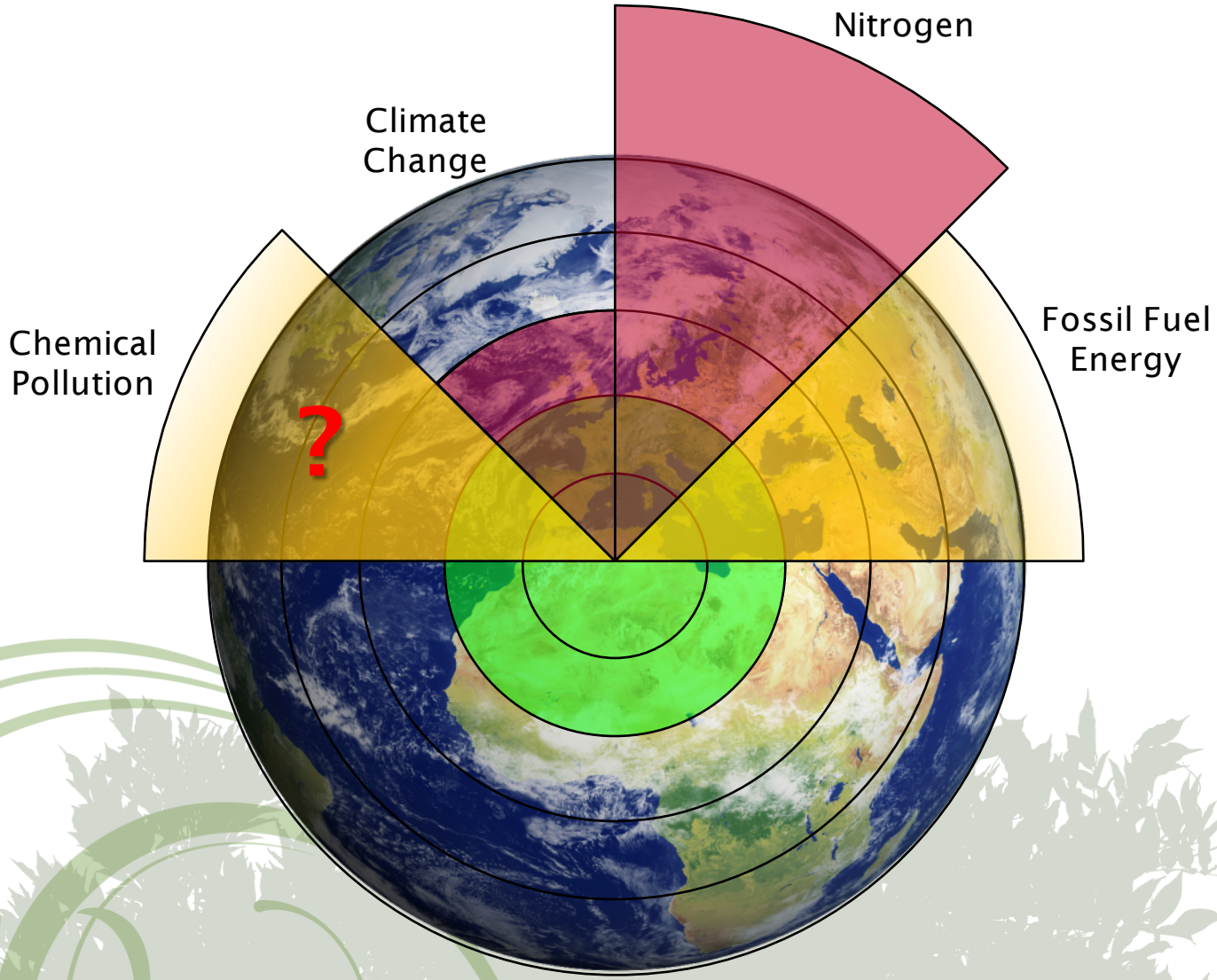
NASA: Earth at Night

Haberl H et al. PNAS 2007;104:12942-12947

Impact of Agriculture on the Planet



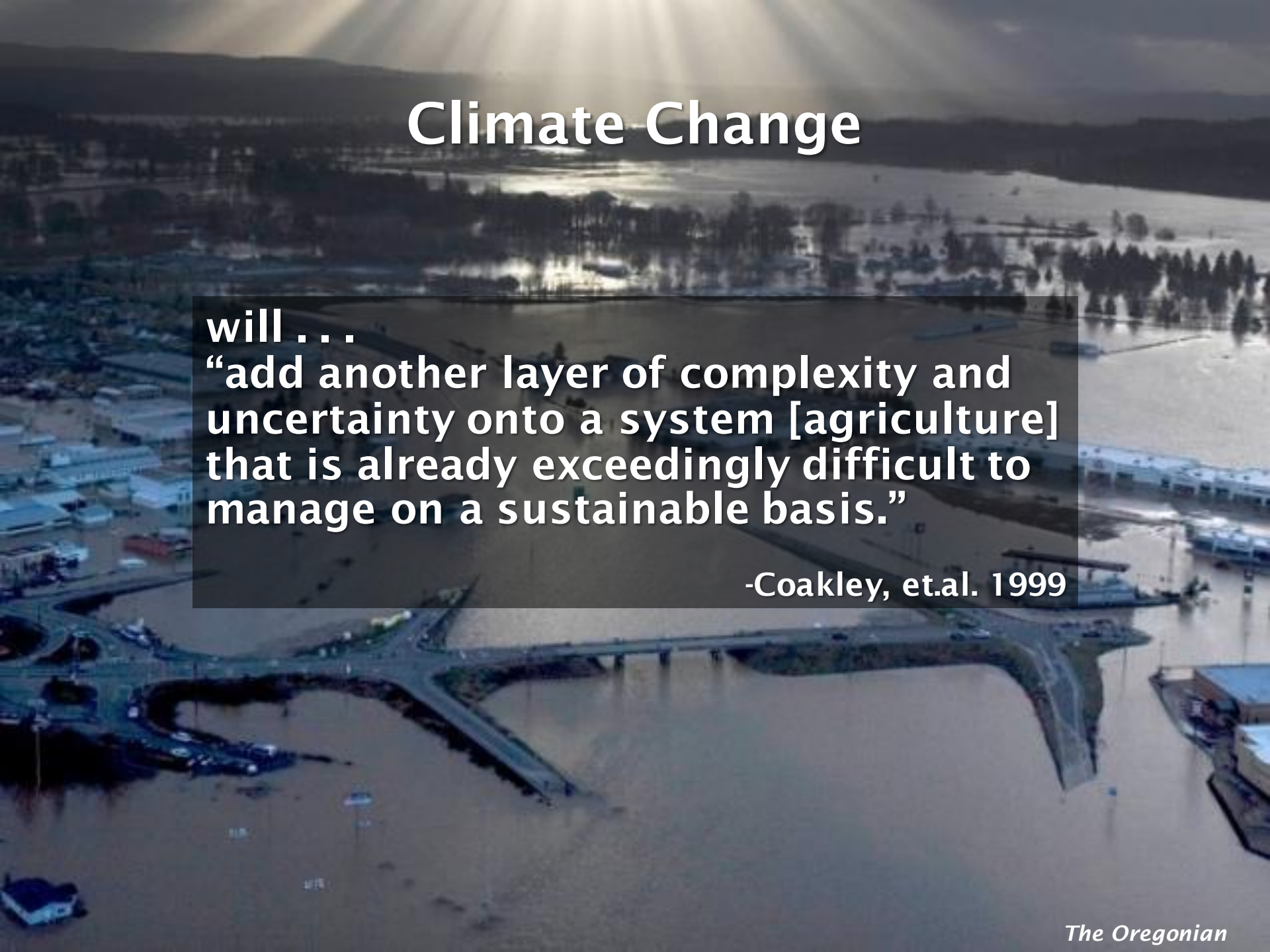
Beyond the Boundary



Adapted from: *Nature*, Vol. 461, Sept 24, 2009

Chemical Pollution

Climate Change

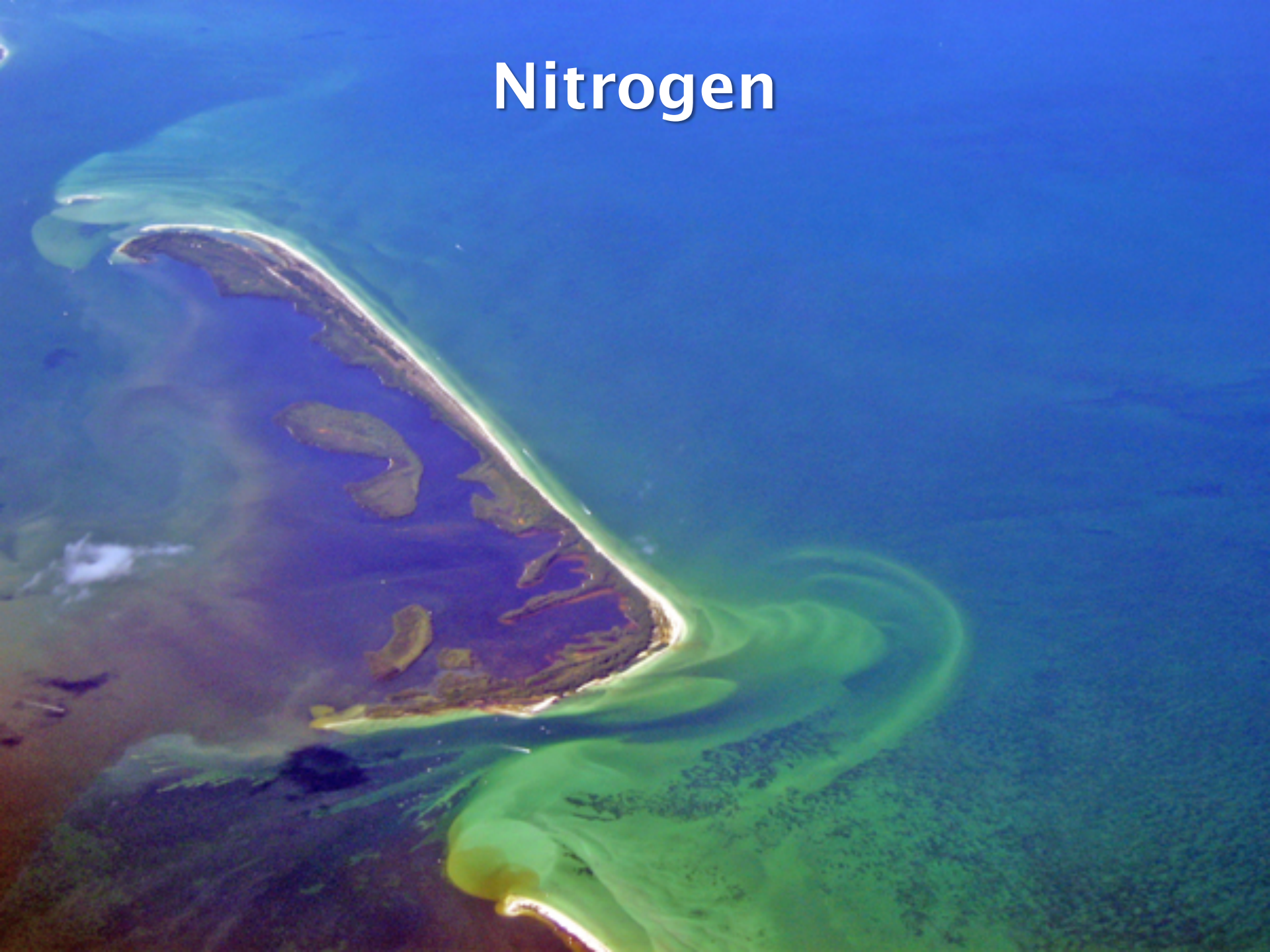


will . . .
“add another layer of complexity and uncertainty onto a system [agriculture] that is already exceedingly difficult to manage on a sustainable basis.”

-Coakley, et.al. 1999

The Oregonian

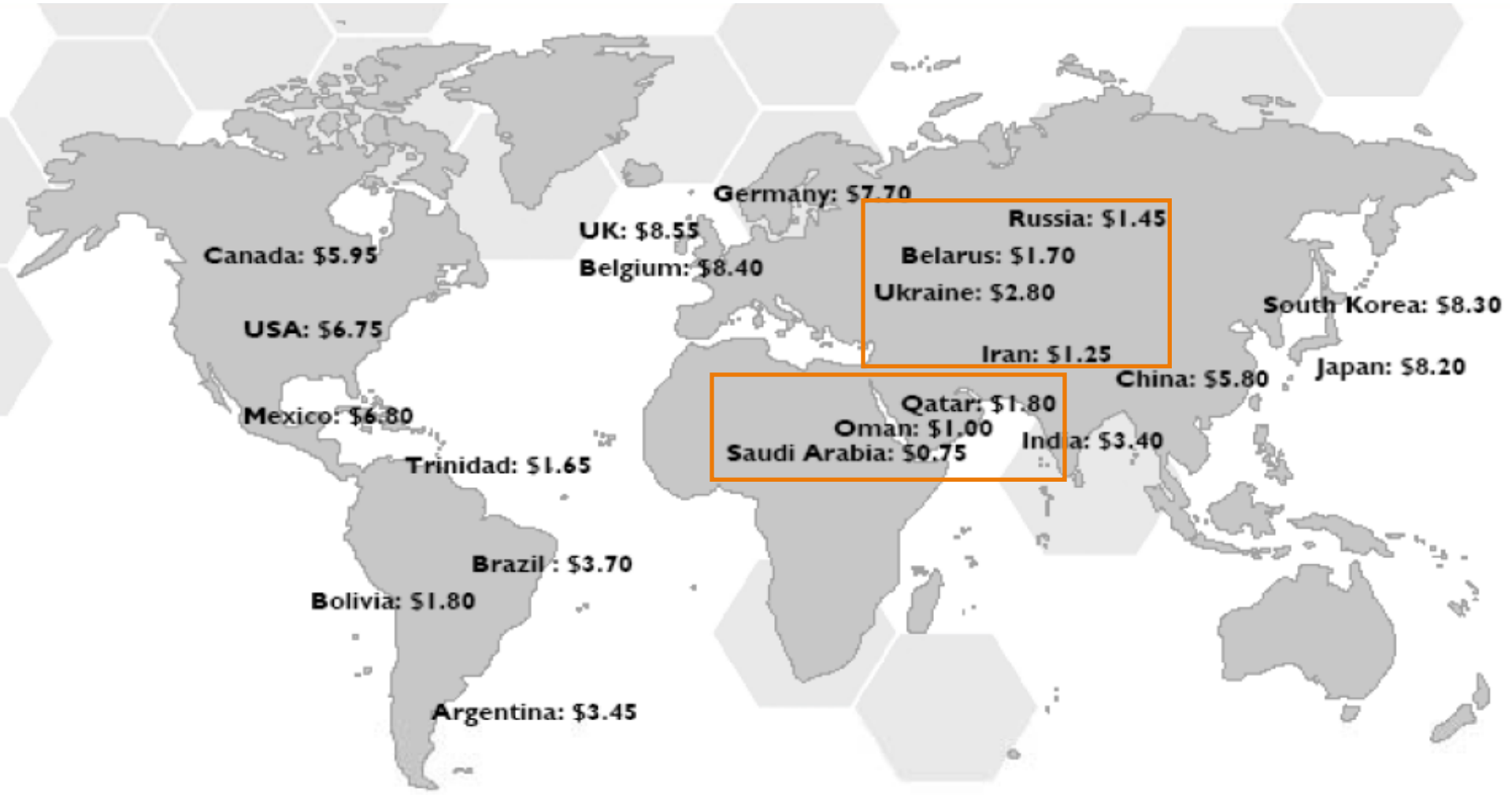
Nitrogen



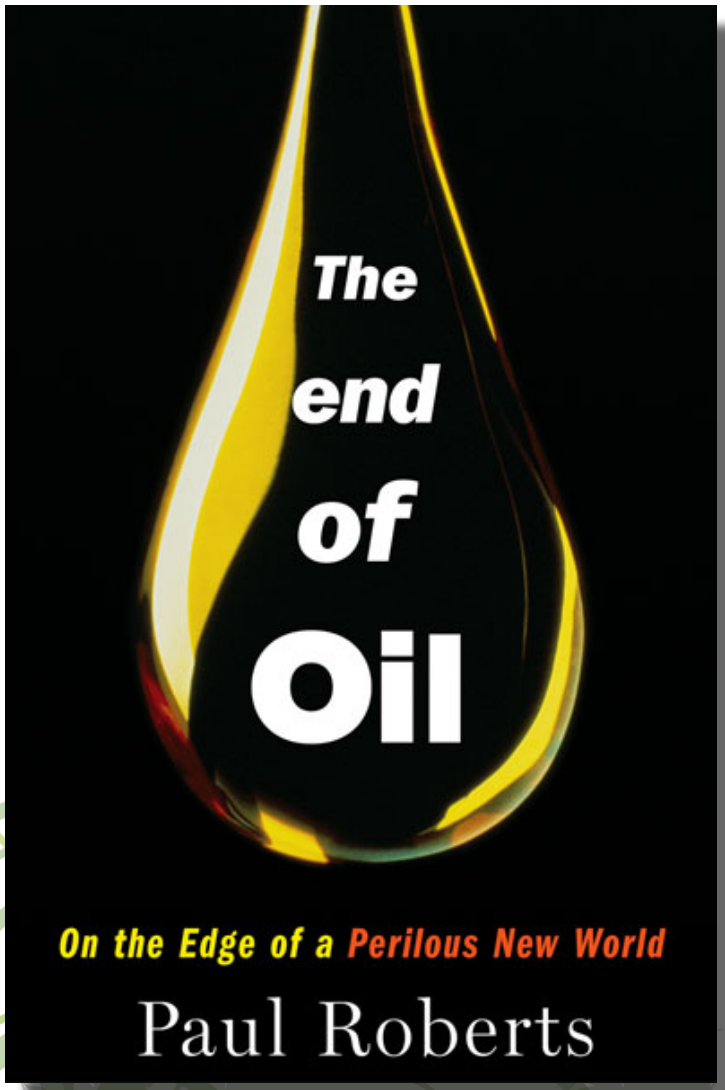
Nitrogen

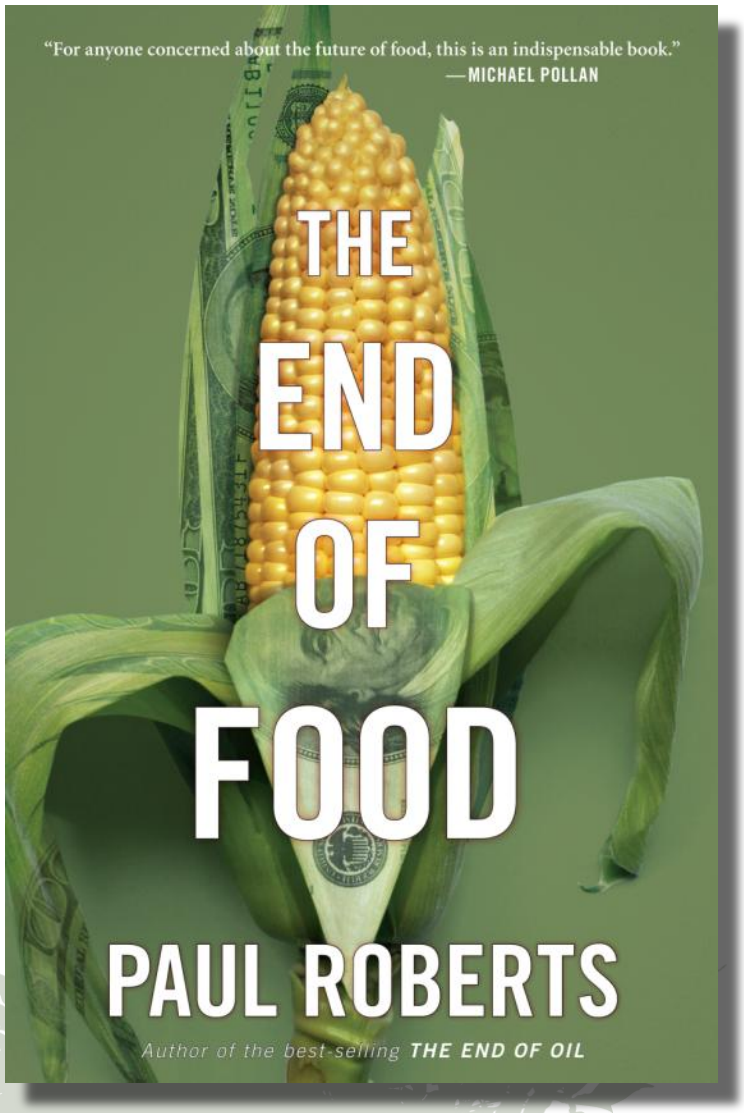
Where Will We Get Our Nitrogen From?

Global Natural Gas Costs – 2006 ($U.S. per million BTUs)



Source: Agrium


The
end
of
Oil
On the Edge of a Perilous New World
Paul Roberts

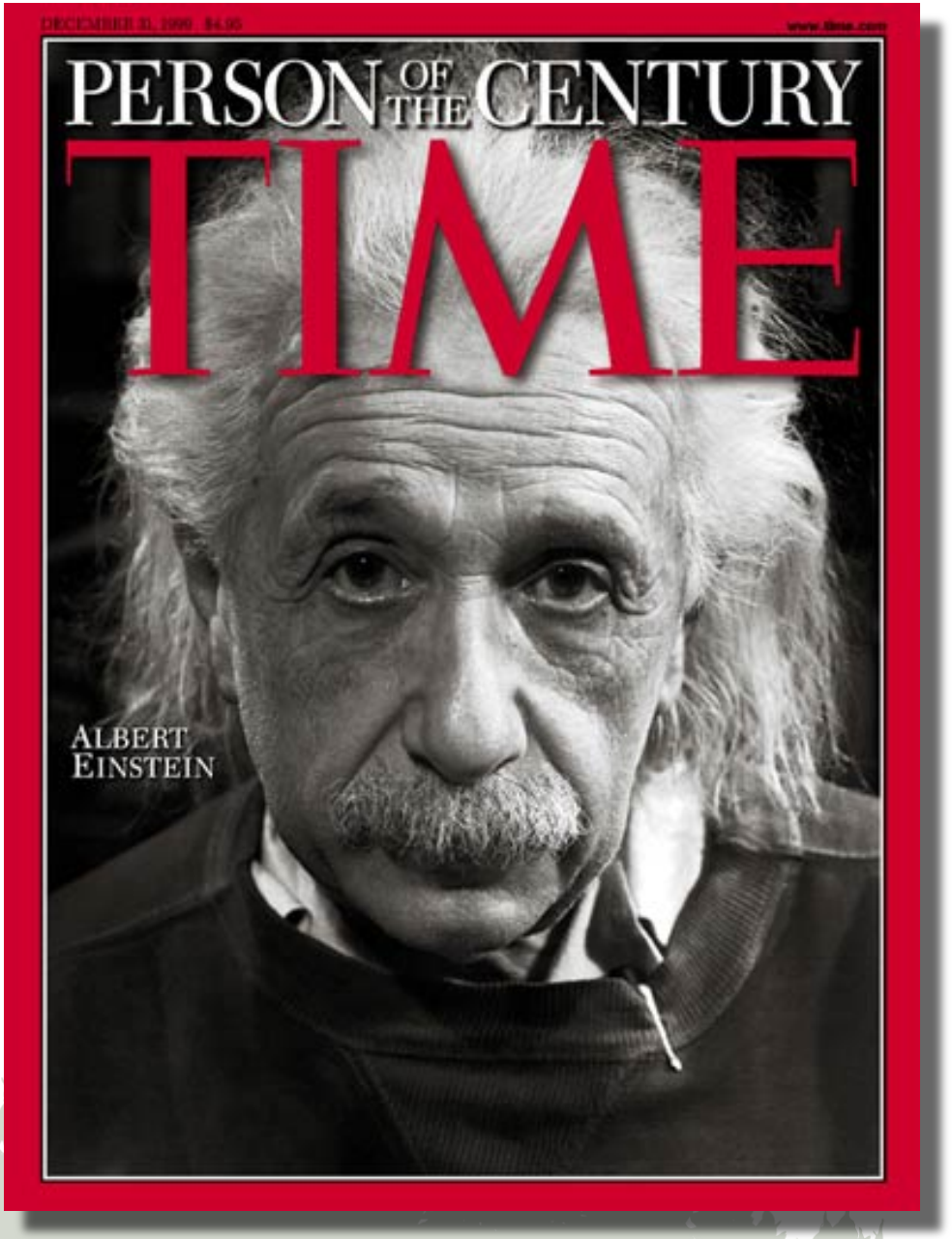

"For anyone concerned about the future of food, this is an indispensable book."
—MICHAEL POLLAN
THE
END
OF
FOOD
PAUL ROBERTS
Author of the best-selling THE END OF OIL

Energy

Center for Sustainable Systems, University of Michigan, 2009. "*U.S. Food System Factsheet*." Pub. No. CSS01-06.

“Today’s problems cannot be solved by thinking the way we thought when we created them.”

-Albert Einstein



green from the ground up

Cultivating a fresh approach to sustainable agriculture

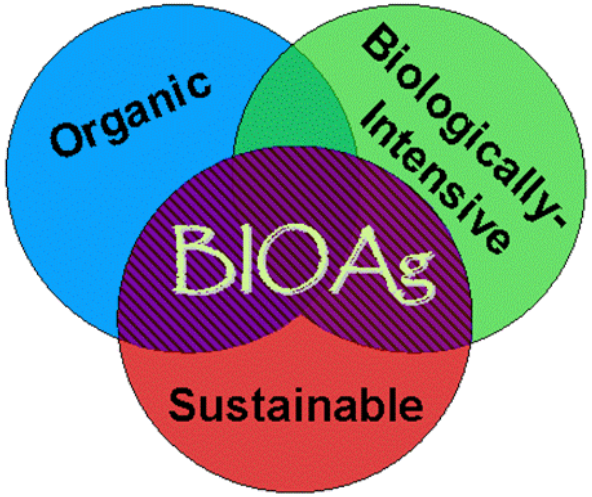
FEATURING

Lynne Carpenter-Boggs, Research Leader for Biologically Intensive and Organic Agriculture (BIOAg), Center for Sustaining Agriculture and Natural Resources


Sustainable agriculture
is *economically* viable,
environmentally sound,
and *socially* responsible.

CSANR

- Created by Washington legislature in 1991
- Conduct, stimulate, and encourage research, extension, and education on sustainable agriculture and natural resource management
- Solve issues in management and society using sustainable practices and principles

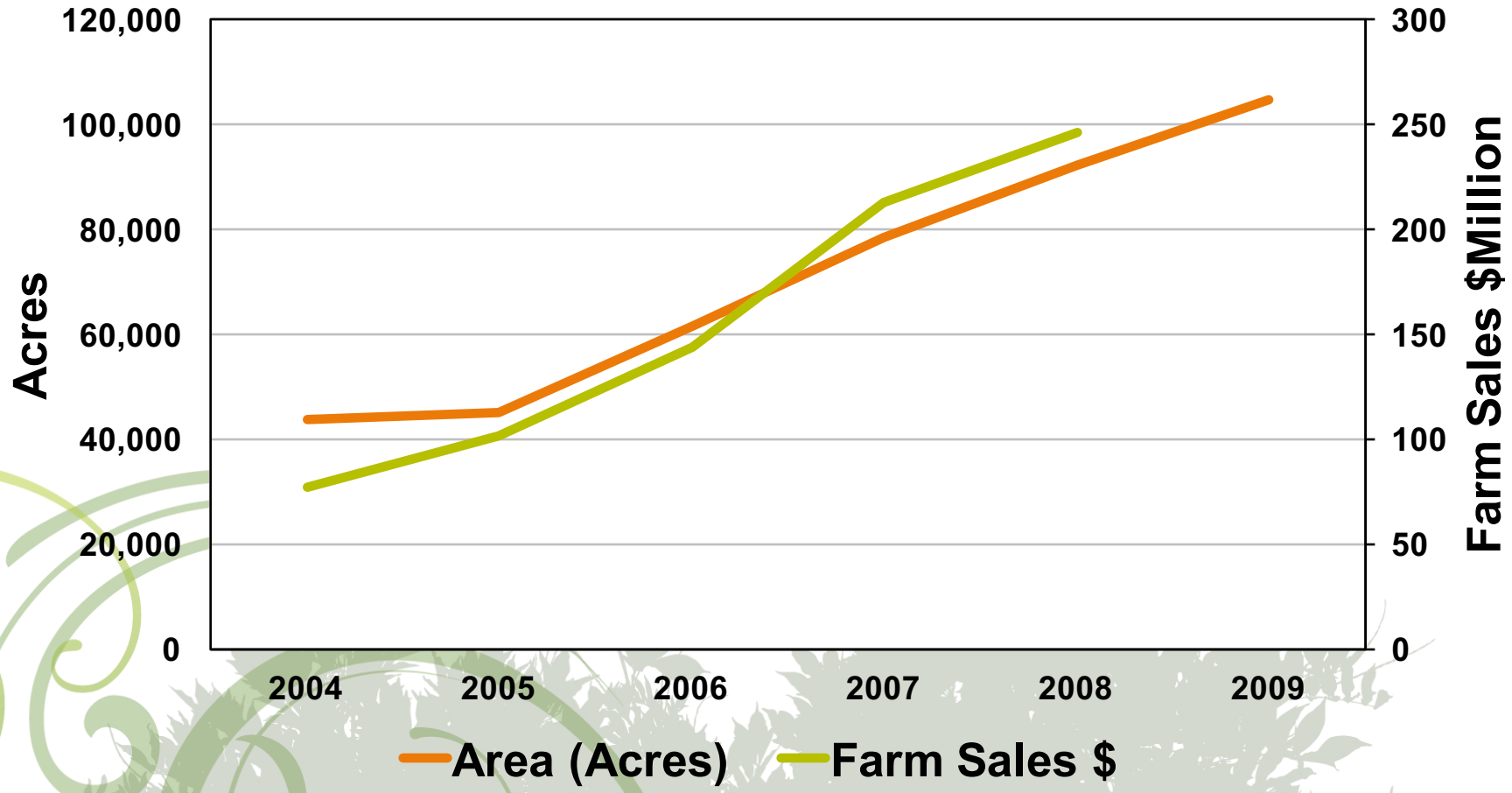


The BIOAg program builds sustainable agriculture for healthy farms, communities and ecosystems by fostering

- **development**
- **understanding**
- **use** of biologically intensive and organic strategies.

BIOAg encourages a more sustainable agriculture through biologically intensive methods, whether organic or not.

Washington State Organic Acres and Farm Sales



Methyl Bromide

- Methyl bromide is on the way out
  - Regulation changes
    - Ozone depletion
    - Danger to applicators and neighbors
  - Cost
- Without treatment, high cull rates and loss of profit

Alternative Disease Controls

- Breakdown of mustards releases anti-fungal compounds
- Can they protect Douglas fir seedlings?

Mustard Green Manure

Green plant is tilled into soil to control many fungal diseases on crop roots.

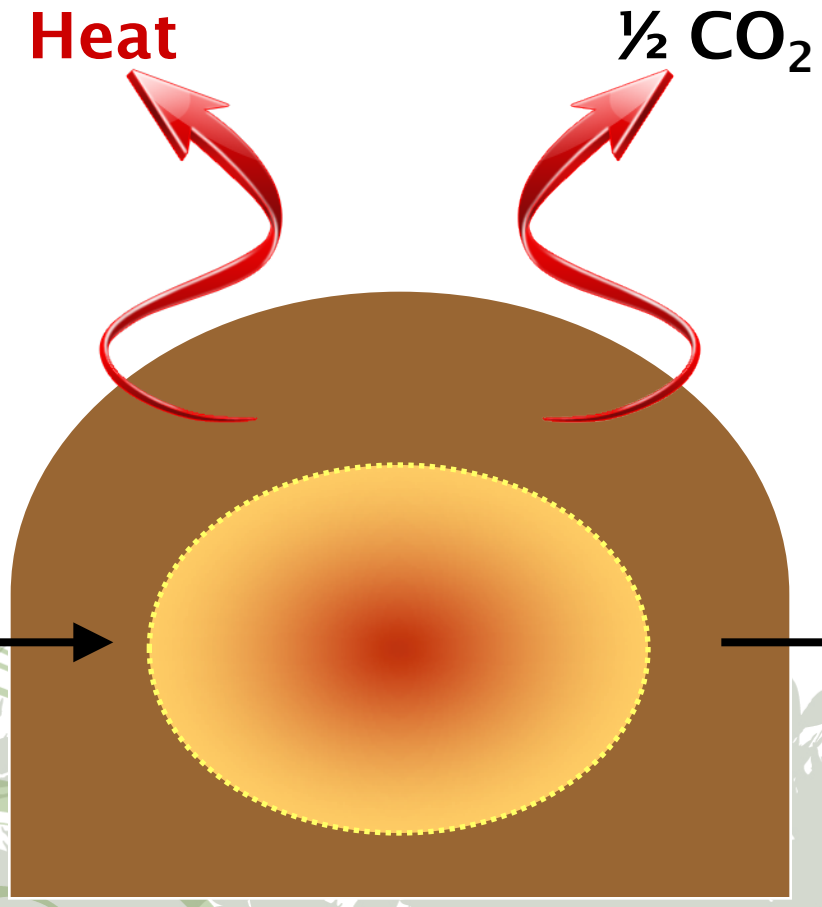
Mustard Green Manures and Seed Meals for Soil-borne Disease Control in Conifer Nurseries

Stewart Higgins applies treatments to conifer seedlings

Graduate student CeCe Crosby identifies the disease agent

Cooperator Nabil Khadduri applies mustard seed meal to field plots

Composting



Raw Materials

- Organic matter
- Oxygen
- Water
- Microbes

Finished compost with humified organic matter

Composting Mint Waste

- Large roadside waste piles smoldered from the heat of decomposition
- Smoke was a hazard to autos on adjacent roads
- Composted mint has good value as fertilizer

Graduate project of Noah Bonds:

Determined the fertilizer value of compost made from mint waste.

Dumping mint waste

Composting mint

Field plots

Demonstrate fertilizer value

Graduate Project of Caitlin Price:
Composting can be a practical method of on-farm carcass disposal

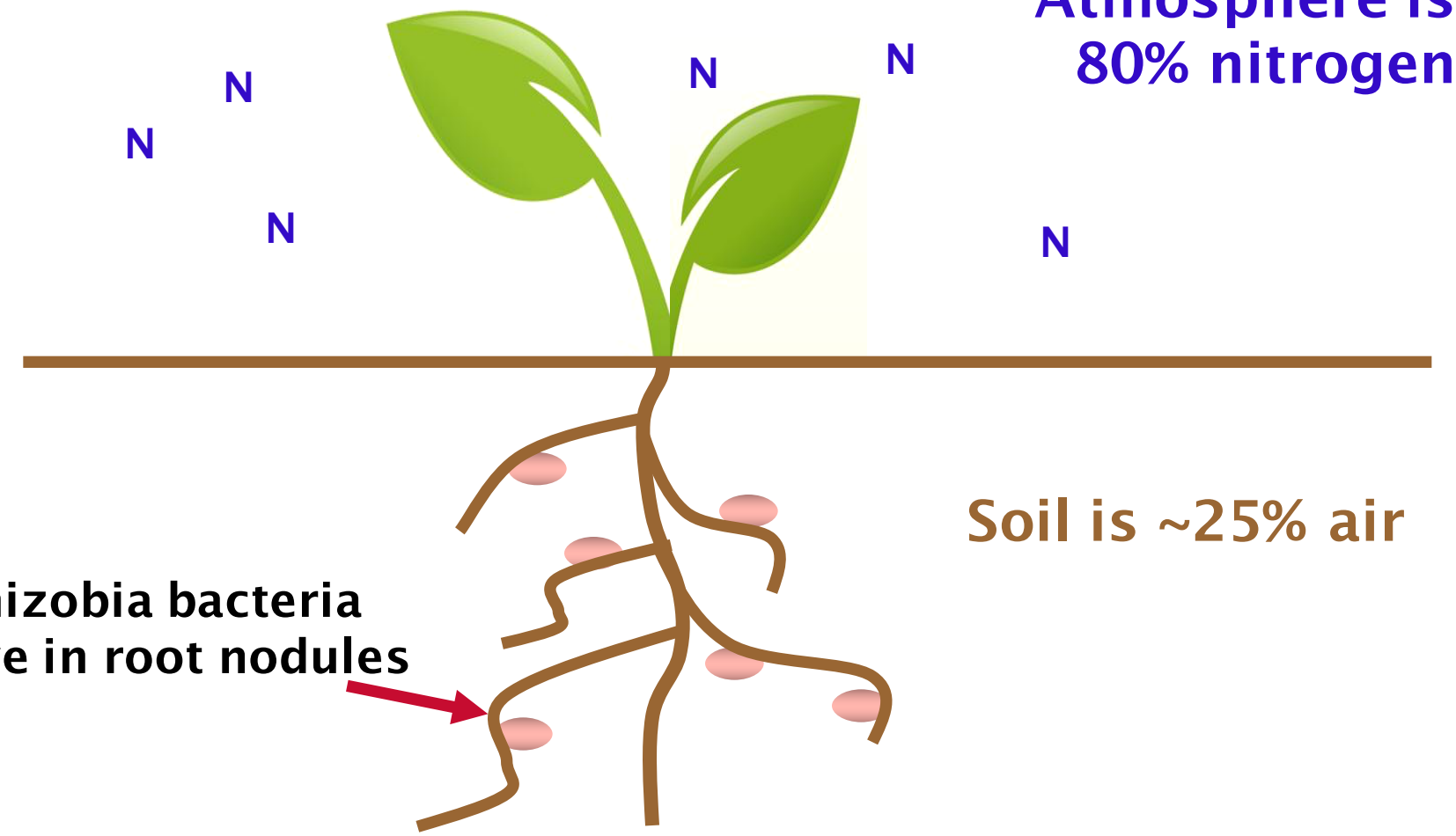
Field day attendees were always surprised at how *little* odor was produced.

32% of Washington Dairies Now Compost Some Carcasses (up from 1% before project)

Flags indicate each bovine carcass


A farmer applying 150 lb. nitrogen/acre
on 1,000 acres paid:
~$30,000 in 2004
~$120,000 in 2009

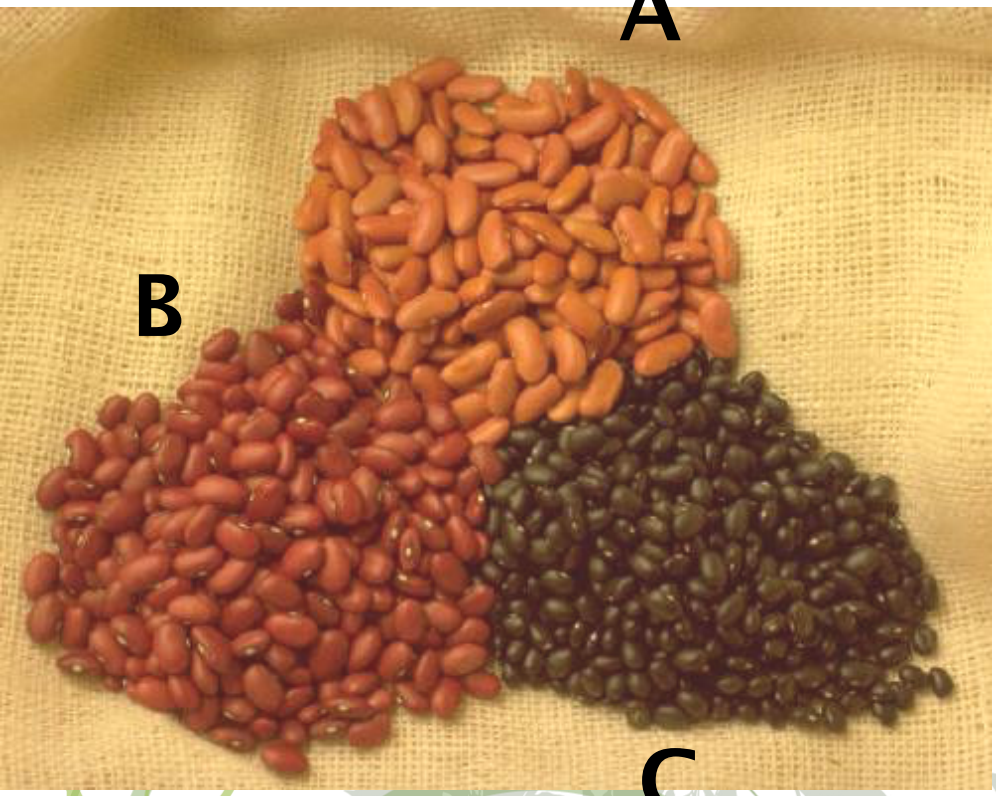
Nitrogen Fixation



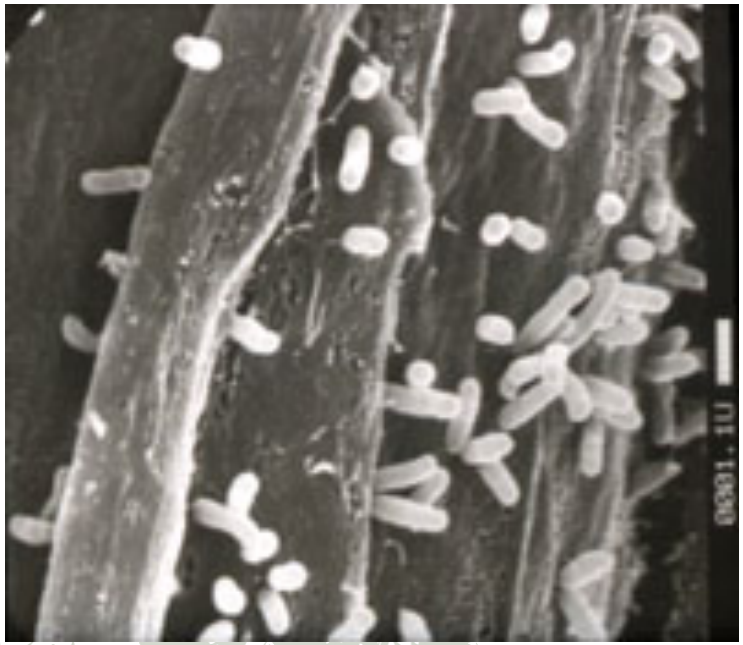
Are all rhizobia created equal?

Lentils in western Manitoba (JK Vessey)

Plant Variety x Rhizobial Strain Trials

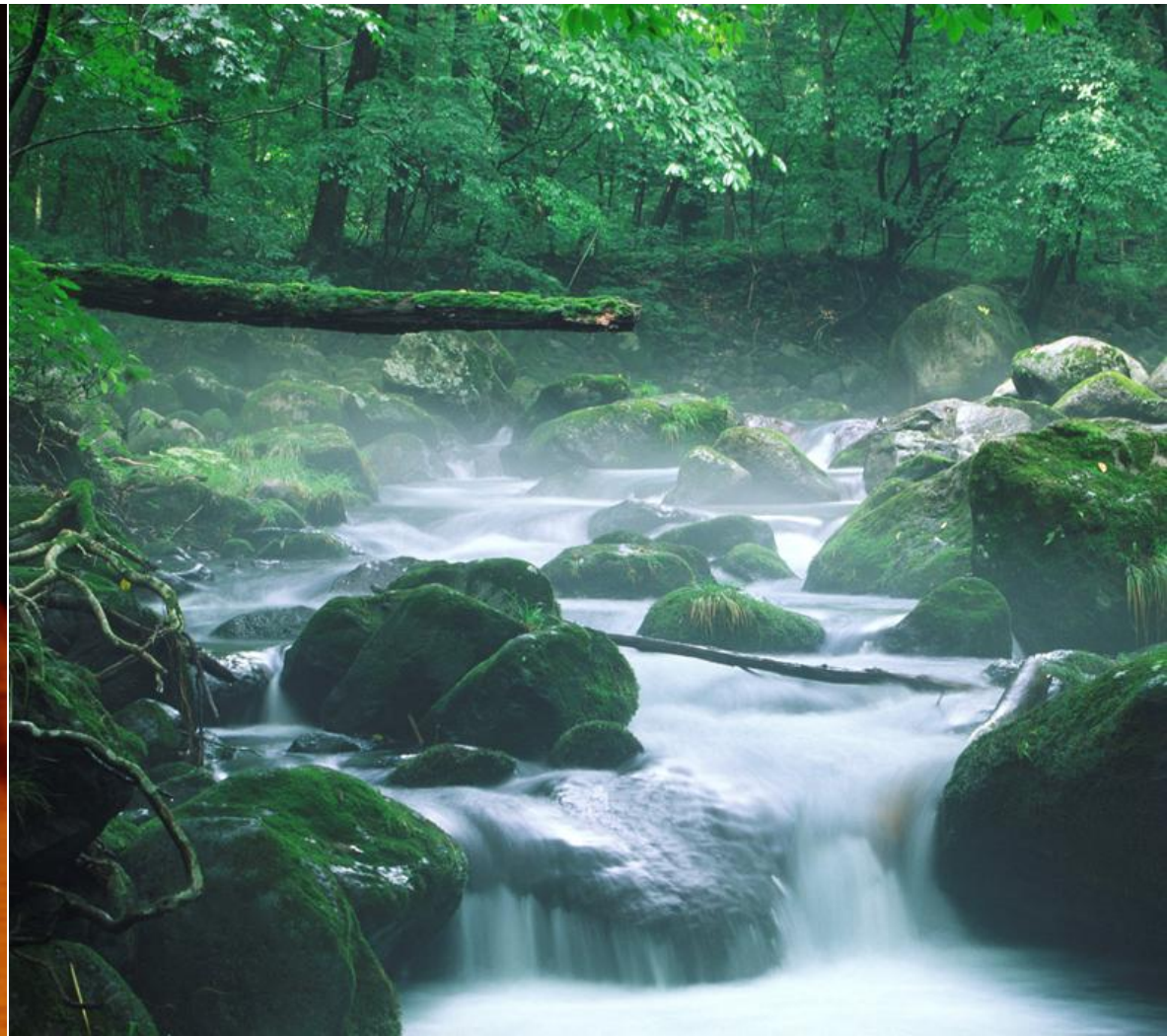


x



Like growing money

…while improving resources



green from the ground up

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CH_4

CO_2

N_2O

CO_2

CO_2

CO_2

CO_2

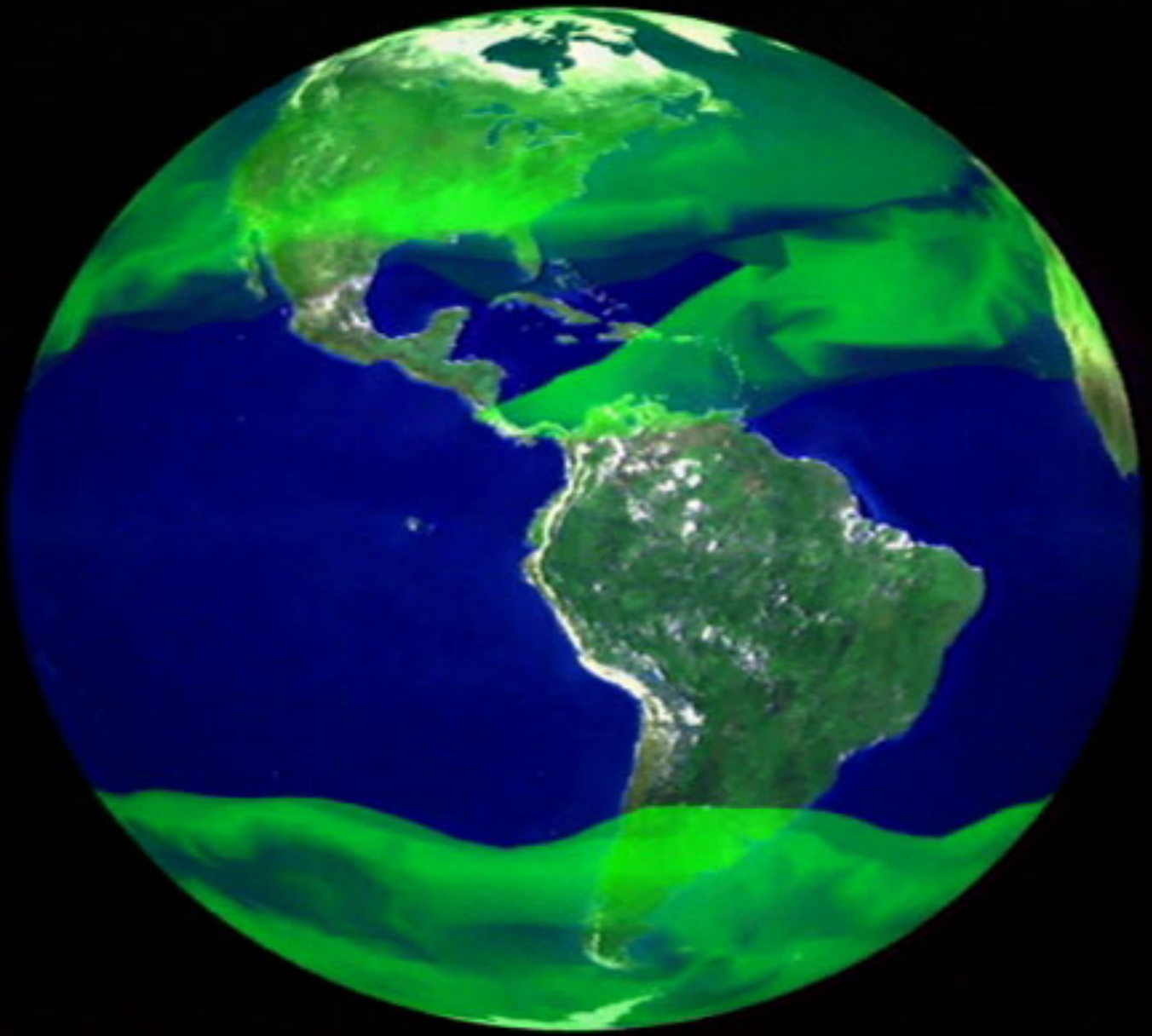
Reduce
Greenhouse Gas Emissions

Restore
Soil Carbon

Replace
Fossil Fuels with Biomass

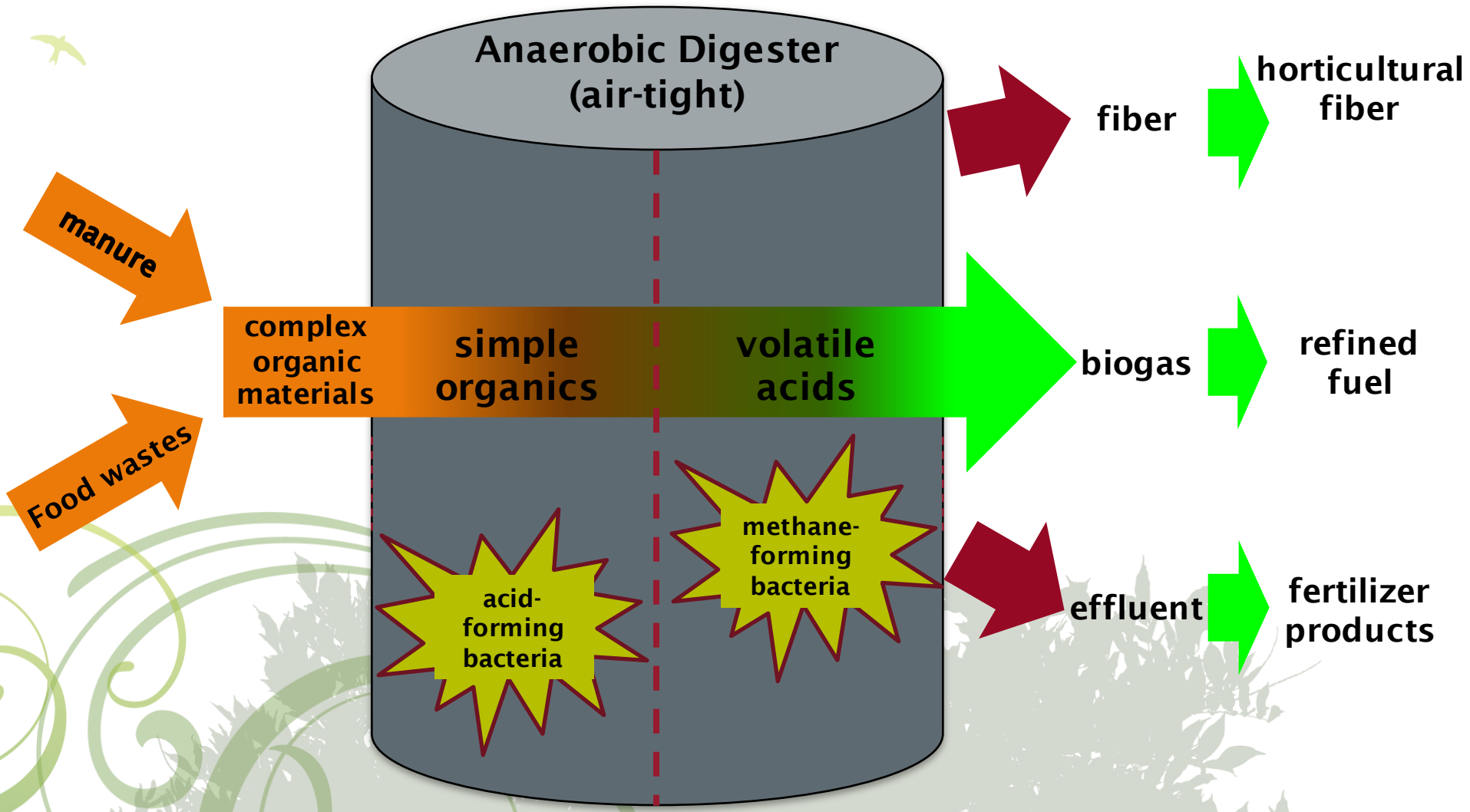
CLIMATE FRIENDLY FARMING™

THE PAUL G. ALLEN FAMILY *foundation*



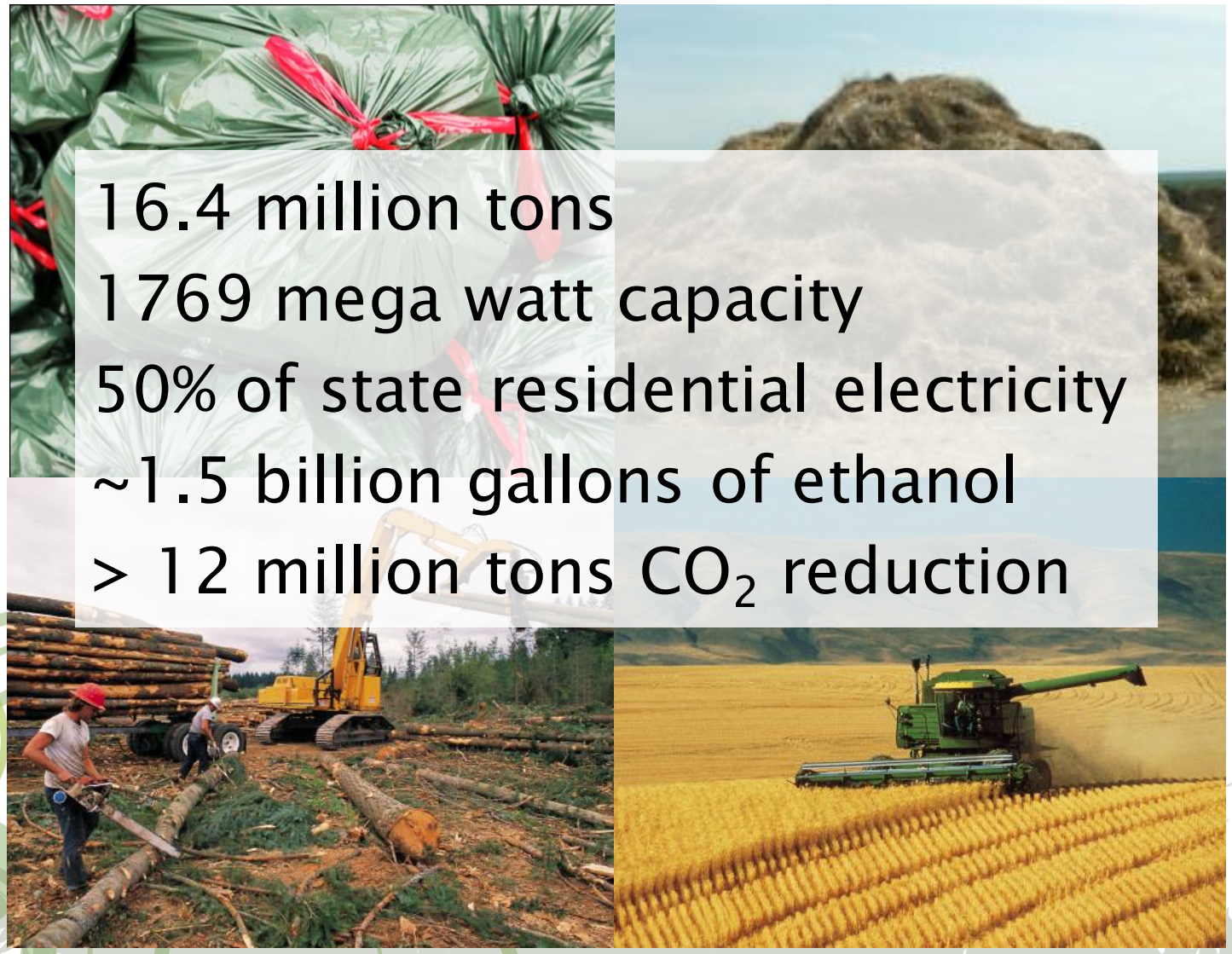
Source: NASA

Converting Waste to Fuels and Resources



Current Anaerobic Digestion Technology

Washington "Waste" Biomass Inventory



16.4 million tons

1769 mega watt capacity

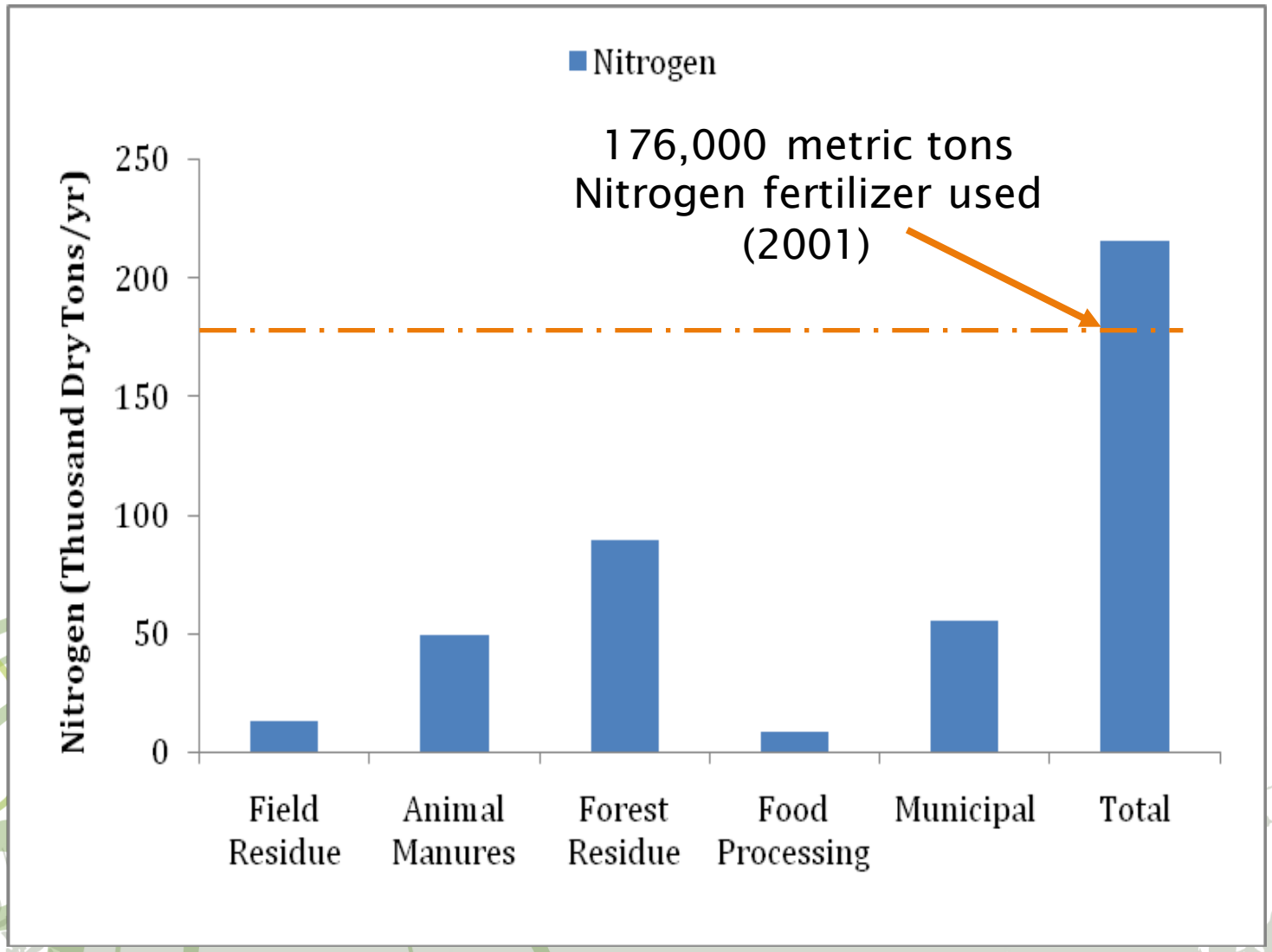
50% of state residential electricity

~1.5 billion gallons of ethanol

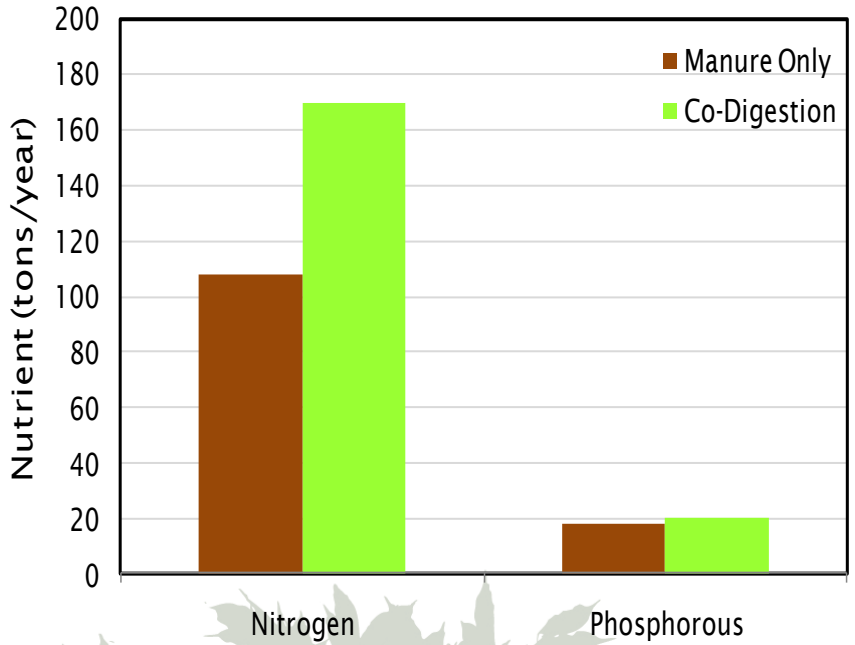
> 12 million tons CO_2 reduction

Source: Ecology

Nitrogen from Washington Biomass Inventory

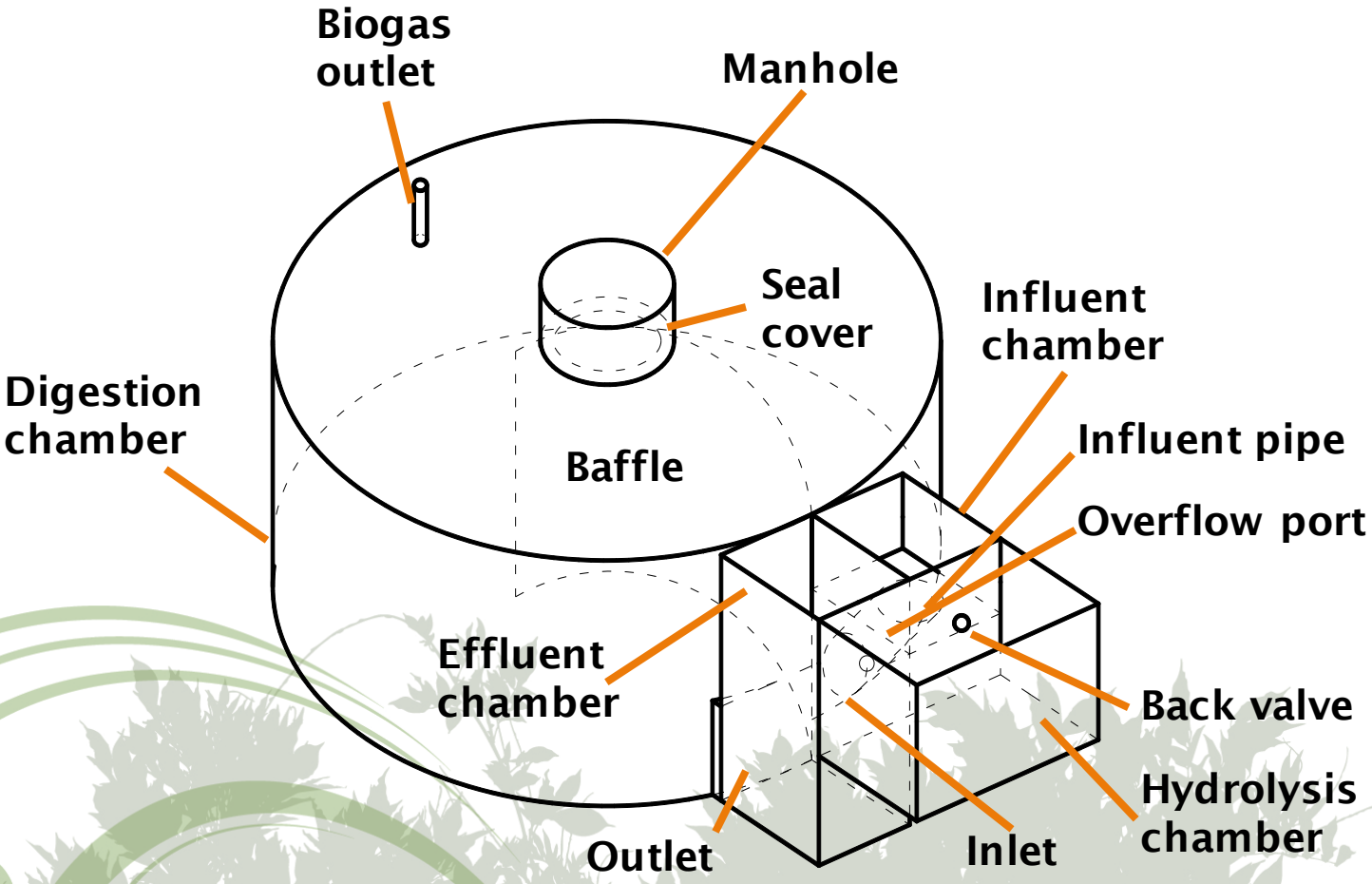


Anaerobic Digestion as a Nutrient Recovery Platform



Biogas as a Transportation Fuel

Small Farm/“Household” Applications



“A good solution solves more than one problem, and it does not make new problems.“

—Wendell Berry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