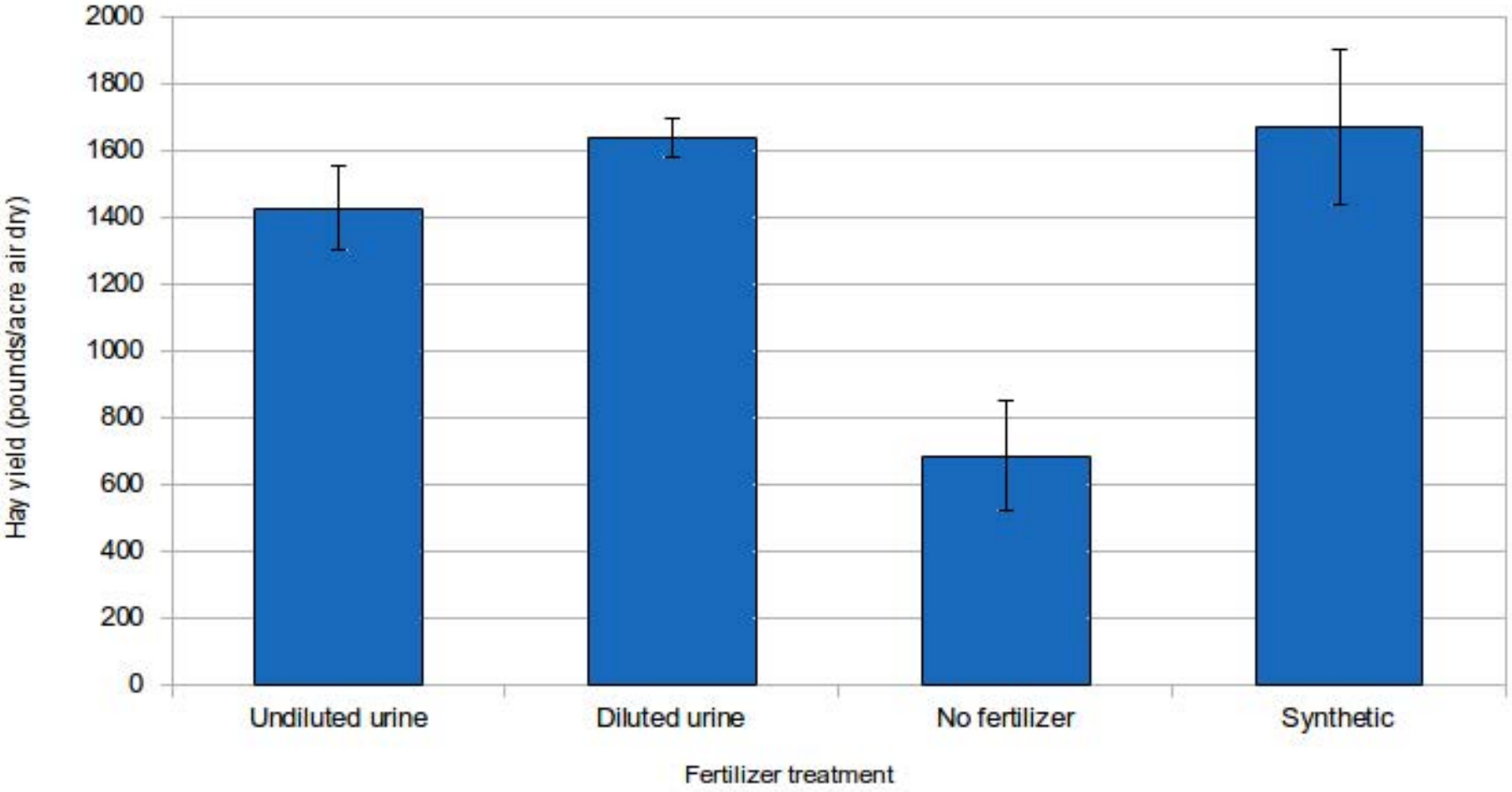
Quantifying Yields

Dilution rate research results



2-Year Pharmaceutical Study

funded by the US Environmental Protection Agency

Tracking pharmaceuticals from urine used as fertilizer:

- Soil
- Groundwater
- Harvested crops

First results published in 2016

Rich Earth Institute in collaboration with:

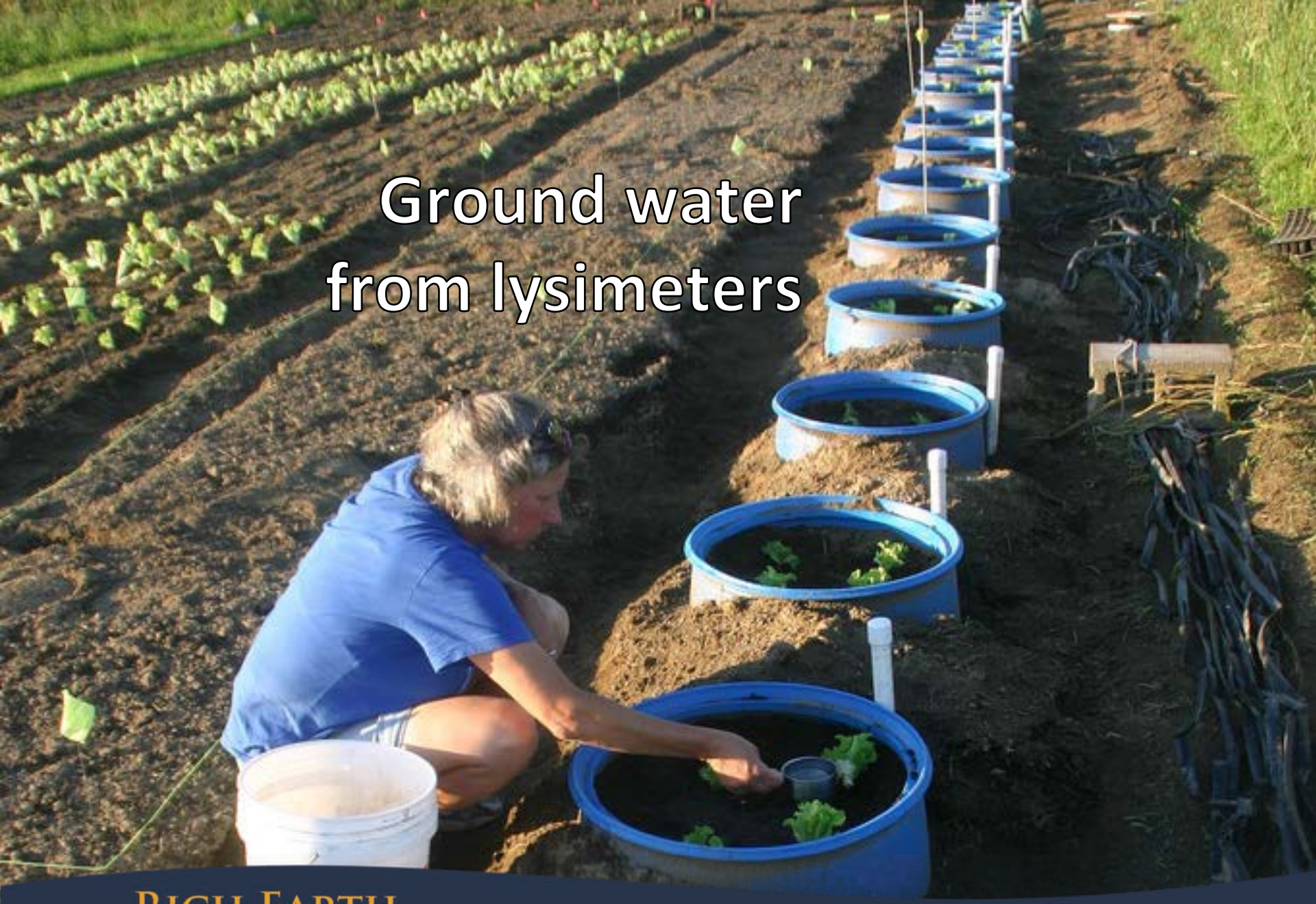
- University of Michigan
- University at Buffalo
- Brown & Caldwell (wastewater engineers)
- Hampton Road Sanitation District

Pharmaceutical contaminants being analyzed

Contaminant	Drug Type
Acetaminophen	analgesic
Caffeine	stimulant
Carbamazepine	anti-seizure
Clofibric Acid	metabolite of the cholesterol-lowering drug Clofibrate
Ciprofloxacin	antibiotic
Diclofenac	nonsteroidal anti-inflammatory
Dilantin	anti-seizure
Erythromycin	antibiotic
Ibuprofen	nonsteroidal anti-inflammatory
Meprobamate	antianxiety
Naproxen	nonsteroidal anti-inflammatory
Sulfamethoxazole	antibiotic
Sulfamethoxazole-acetyl conjugate	metabolite of antibiotic sulfamethoxazole
Trimethoprim	antibiotic

Portable toilets at public events used to collect broad sample of urine

Field-preparation of urine samples


Ground water
from lysimeters

Crop samples

RICH EARTH INSTITUTE

Fertilizer from Urine: Clean Rivers. Sustainable Farms.

Results

Eat: 1 salad/day for 2000 years
Receive: Caffeine from one 8 oz cup coffee

Eat:150,400 carrots
Receive: One 500 mg Tylenol