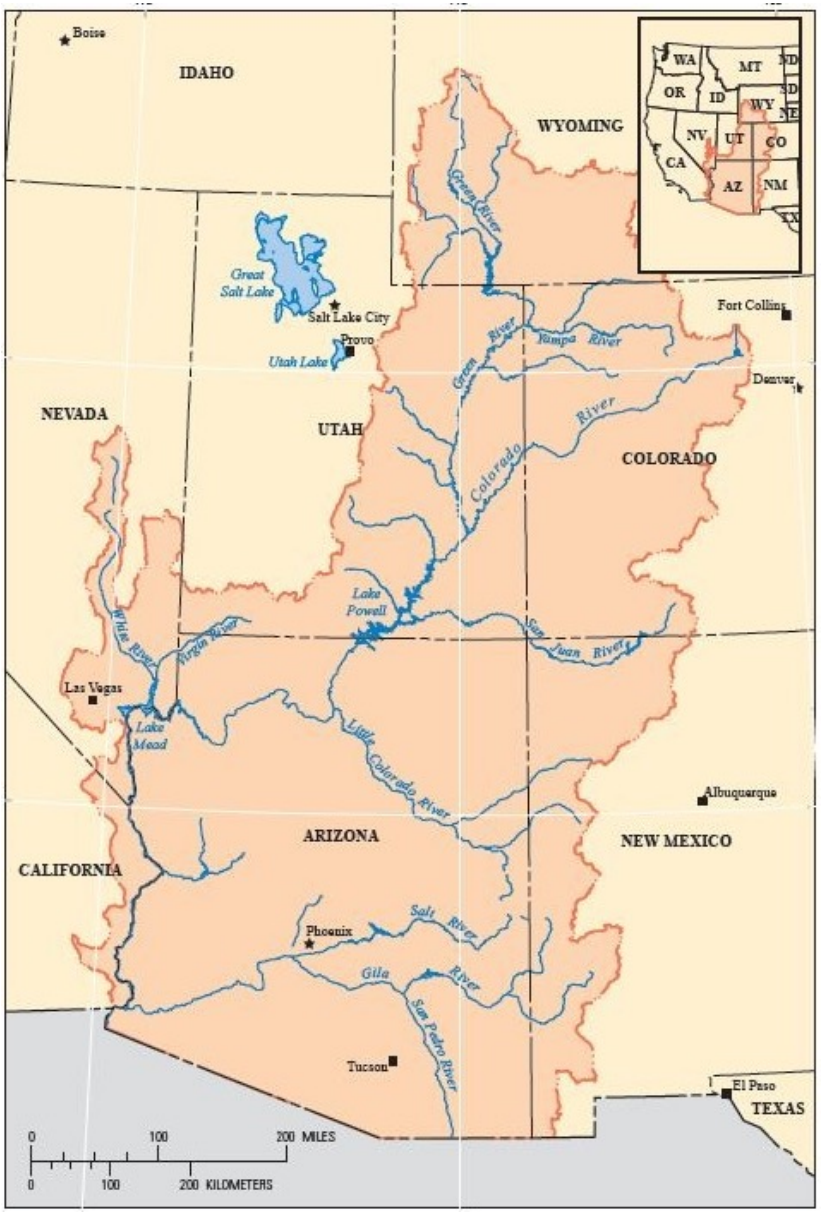
THE POWER TO MAKE THINGS GROW

WATER QUALITY – CHALLENGES AND OPPORTUNITIES

John S. Kruse, Ph.D.

KOCH AGRONOMIC SERVICES



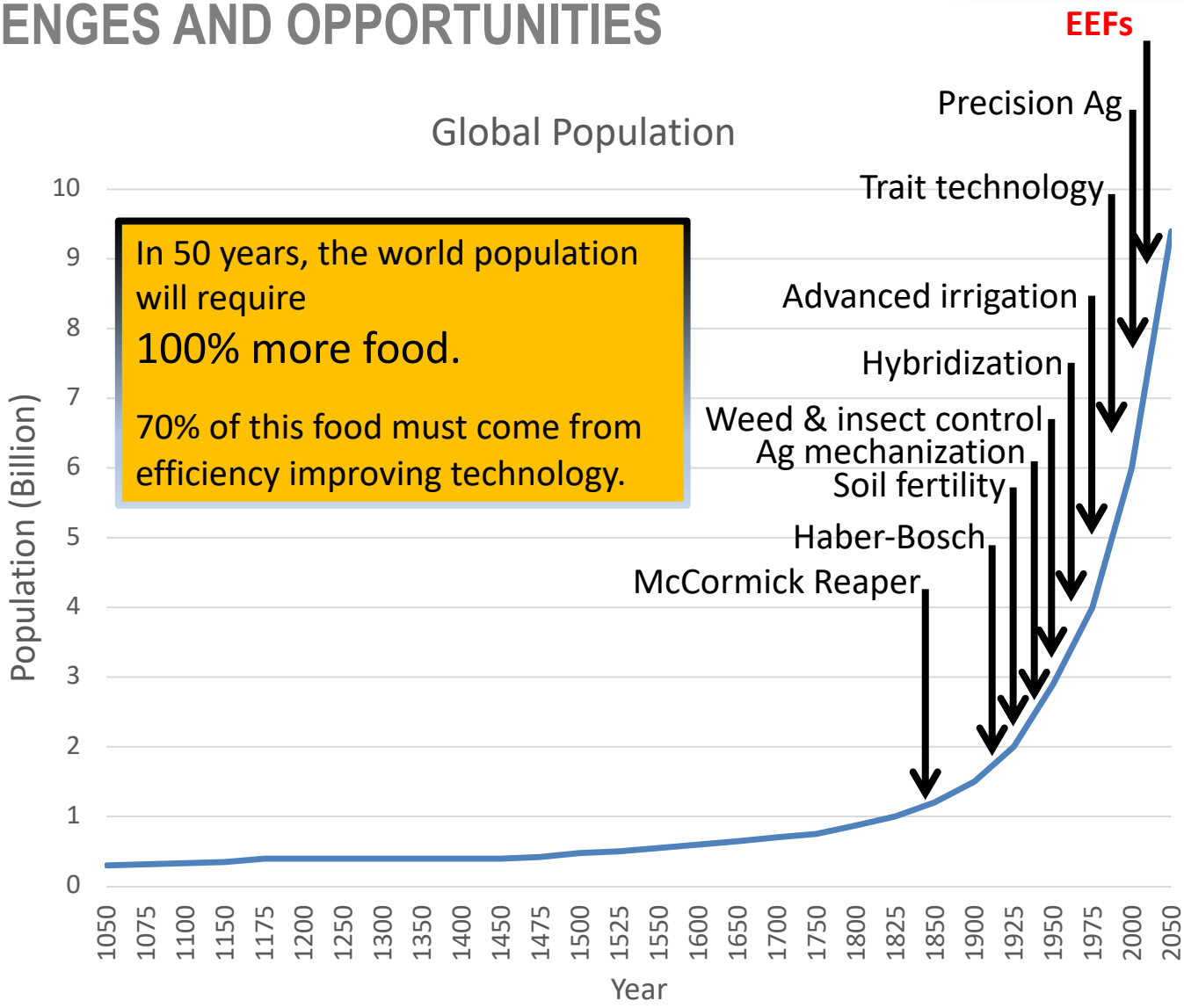
Source: USGS.GOV

We have to feed the world on the land we have.

Source: NASA.GOV

How do we balance water quality concerns with food demand?

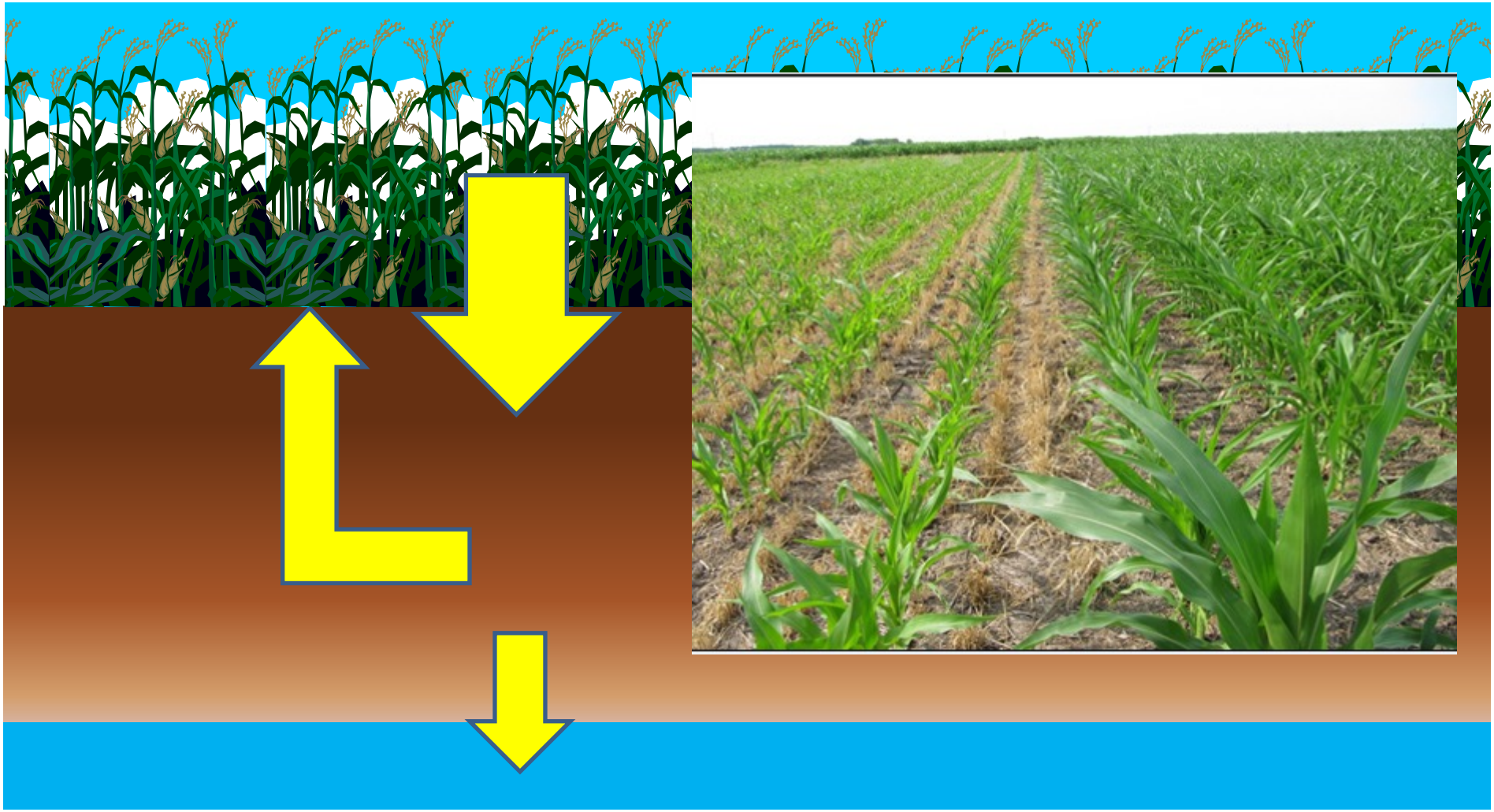
CHALLENGES AND OPPORTUNITIES



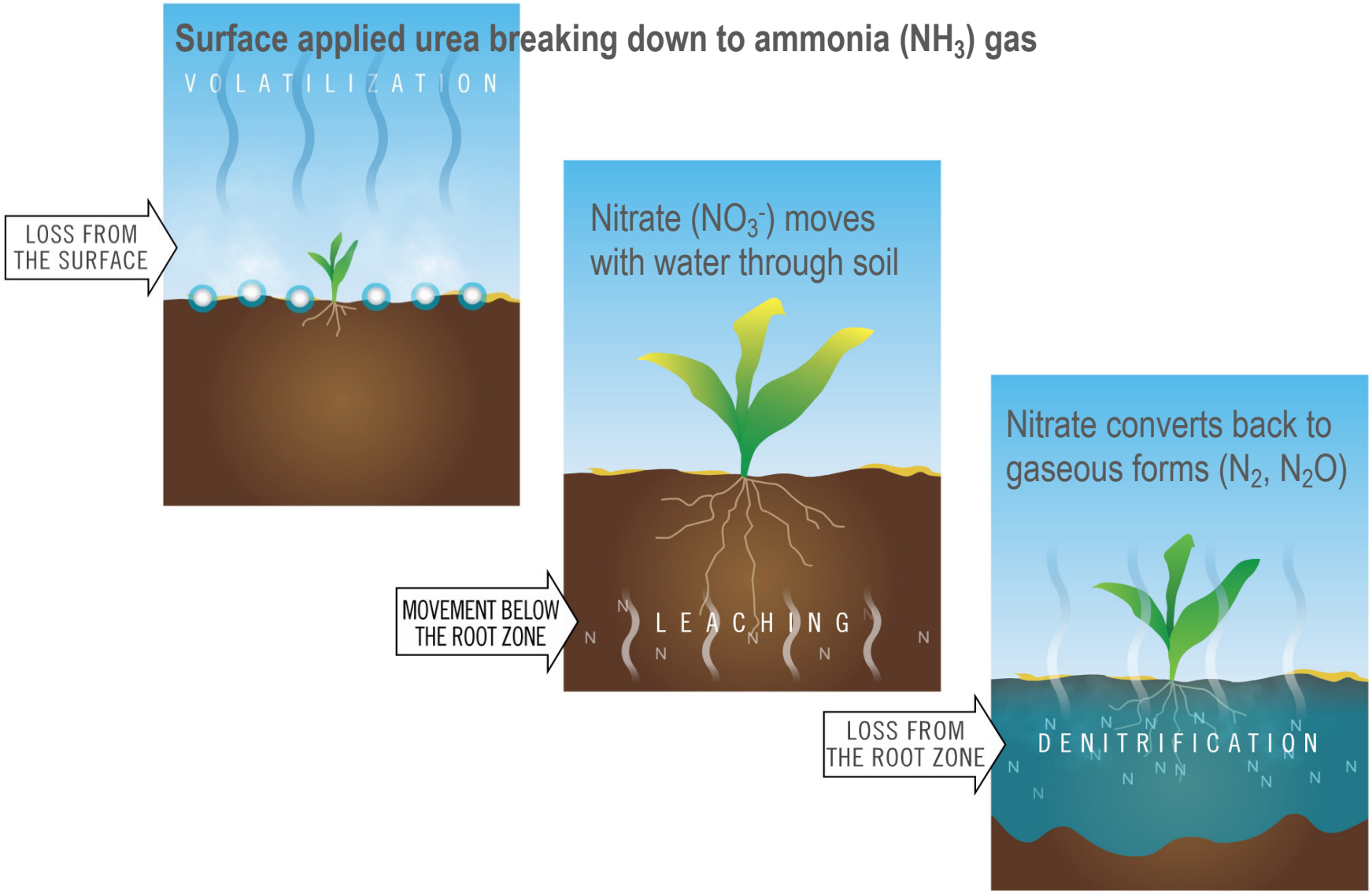
Source: [1] *Green, R. et al., January 2005. "Farming and the Fate of Wild Nature." Science 307.5709:550-555; and Tilman, D. et al., August 2002. "Agriculture Sustainability and Intensive Production Practices." Nature 418.6898:671-677.*

[2] *"Number of Hungry People Rise to 963 Million." United Nations Food and Agriculture Organization, Rome. Accessed 12/19/09. http://www.fao.org/news/story/en/item/8836/icode/*

THE CHALLENGES – CROPS NEED NITROGEN – SOILS ARE A SEMI-OPEN SYSTEM

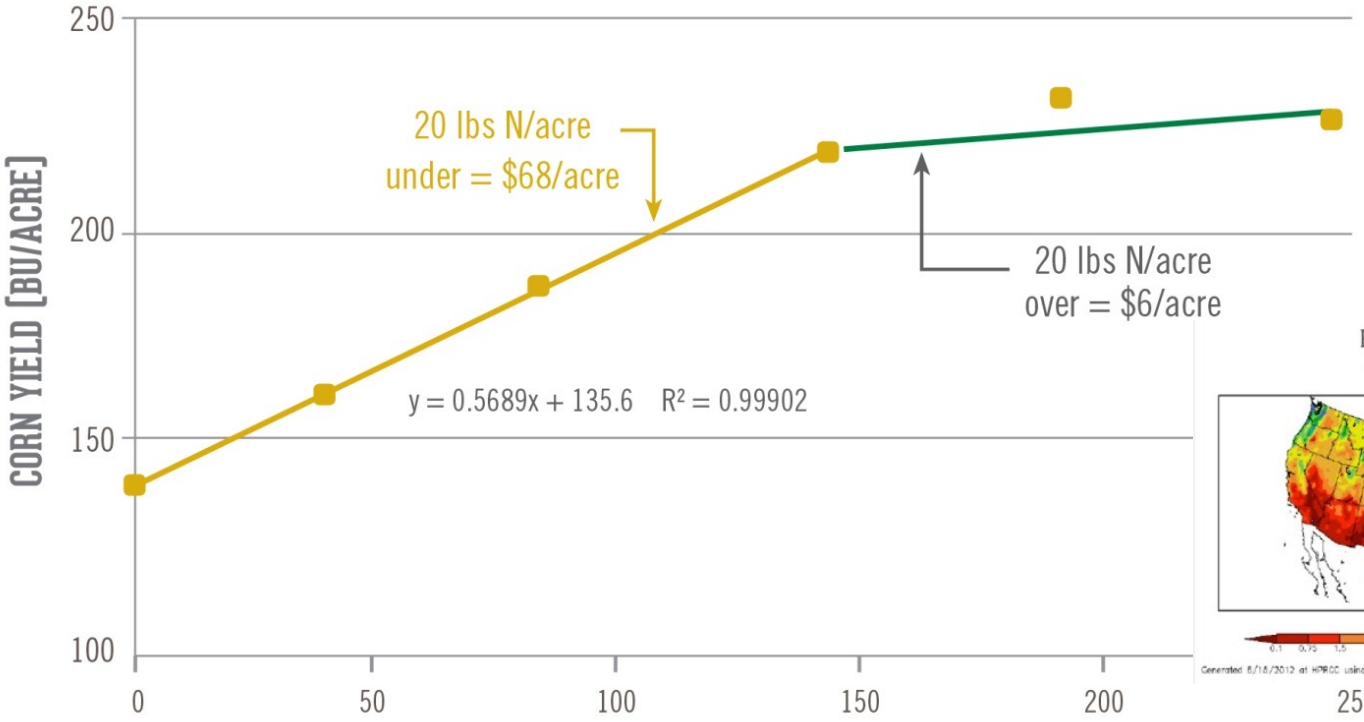


KEY N LOSS MECHANISMS

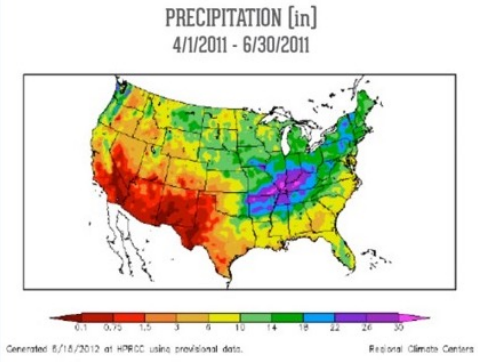


A FARMER'S PERSPECTIVE ON N FERTILIZER LOSS

CORN RESPONSE TO N APPLICATIONS IN KENTUCKY - 2011

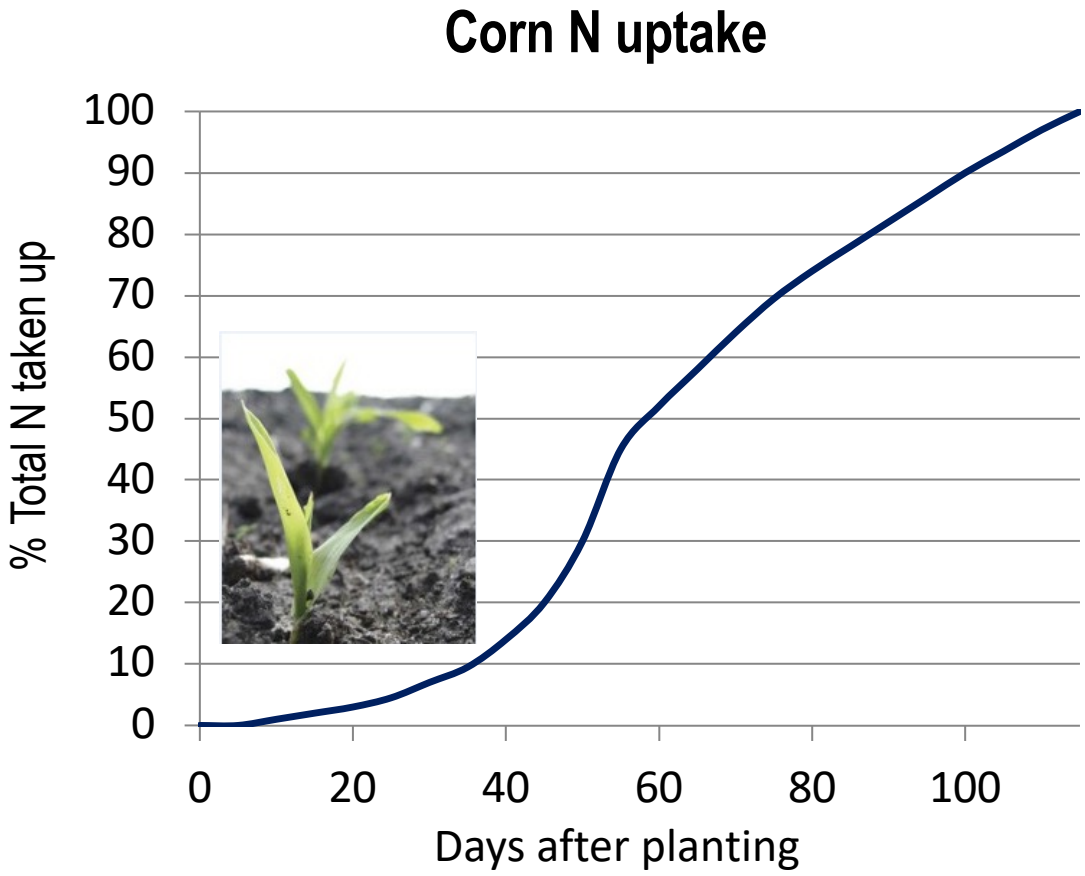


EXAMPLE: 1500 ACRE FARM



Source: Grove, 2011

EEFS REDUCE POTENTIAL FOR N LOSS



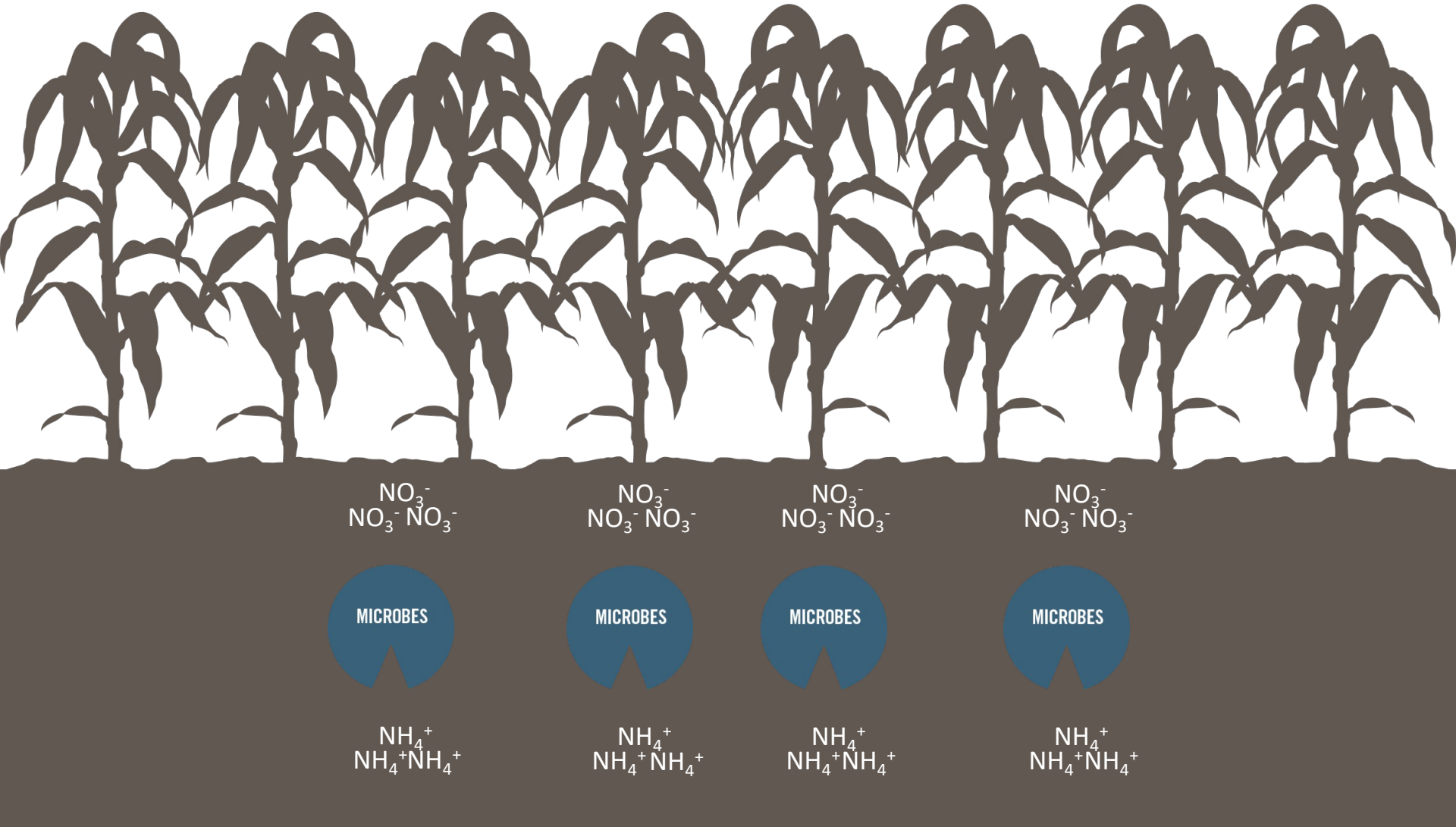
Enhanced efficiency fertilizers store nitrogen until the crop can take it up.

Source: http://pubs.ext.vt.edu

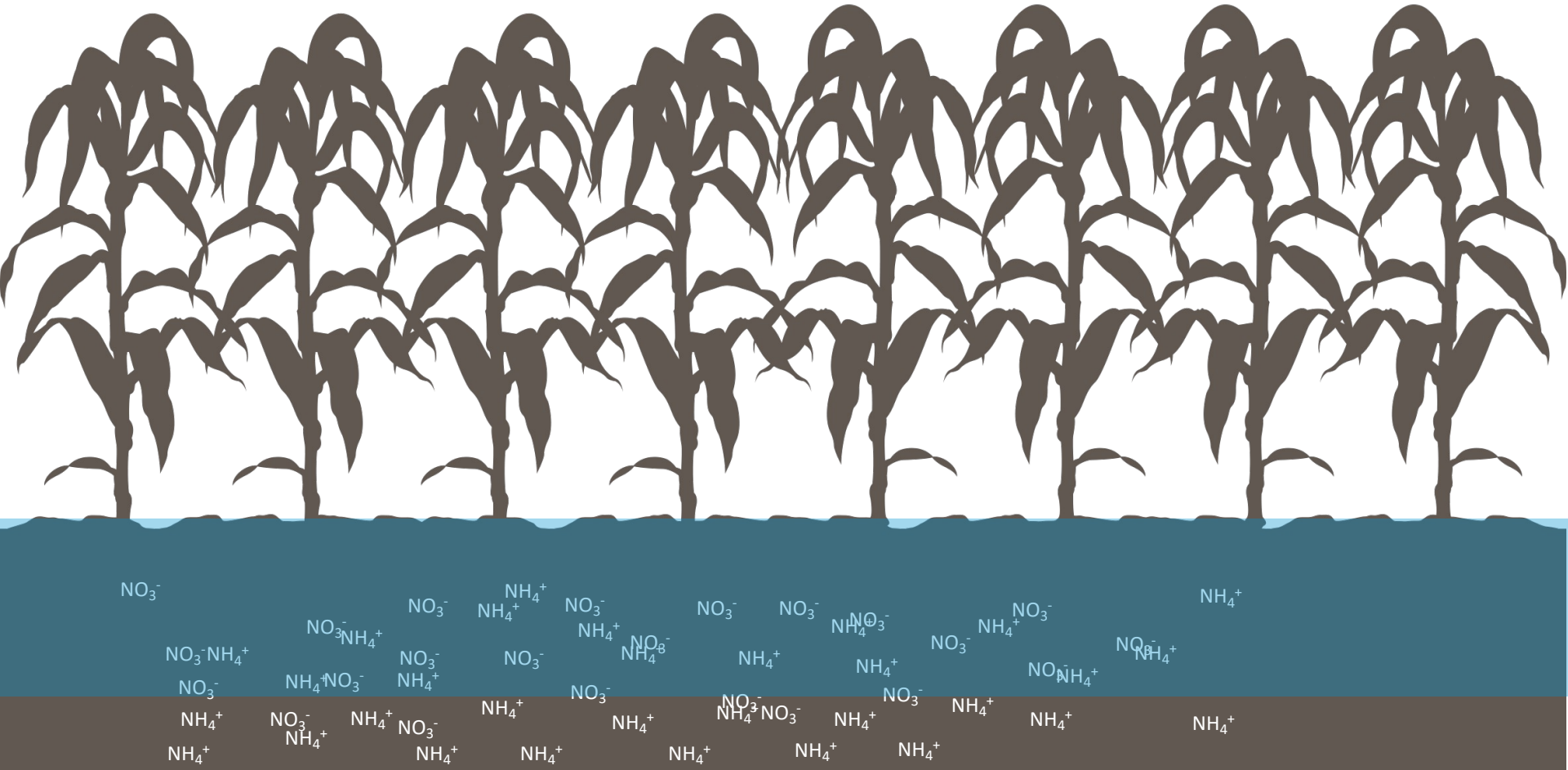
KOCH
AGRONOMIC SERVICES

NITRIFICATION: CREATES NITRATE THAT IS VULNERABLE TO LOSS

Ammonium (NH_4^+) transforms to Nitrate (NO_3^-)

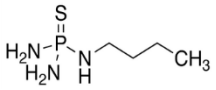


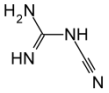
NITRIFICATION CAN RESULT IN LEACHING LOSSES



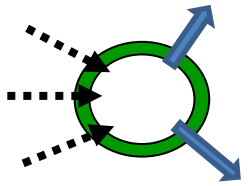
EEFs – ENHANCED EFFICIENCY FERTILIZERS

- Inhibitor Technology – <u>stores</u> nitrogen in the NH_4^+ plant available form

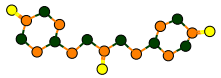


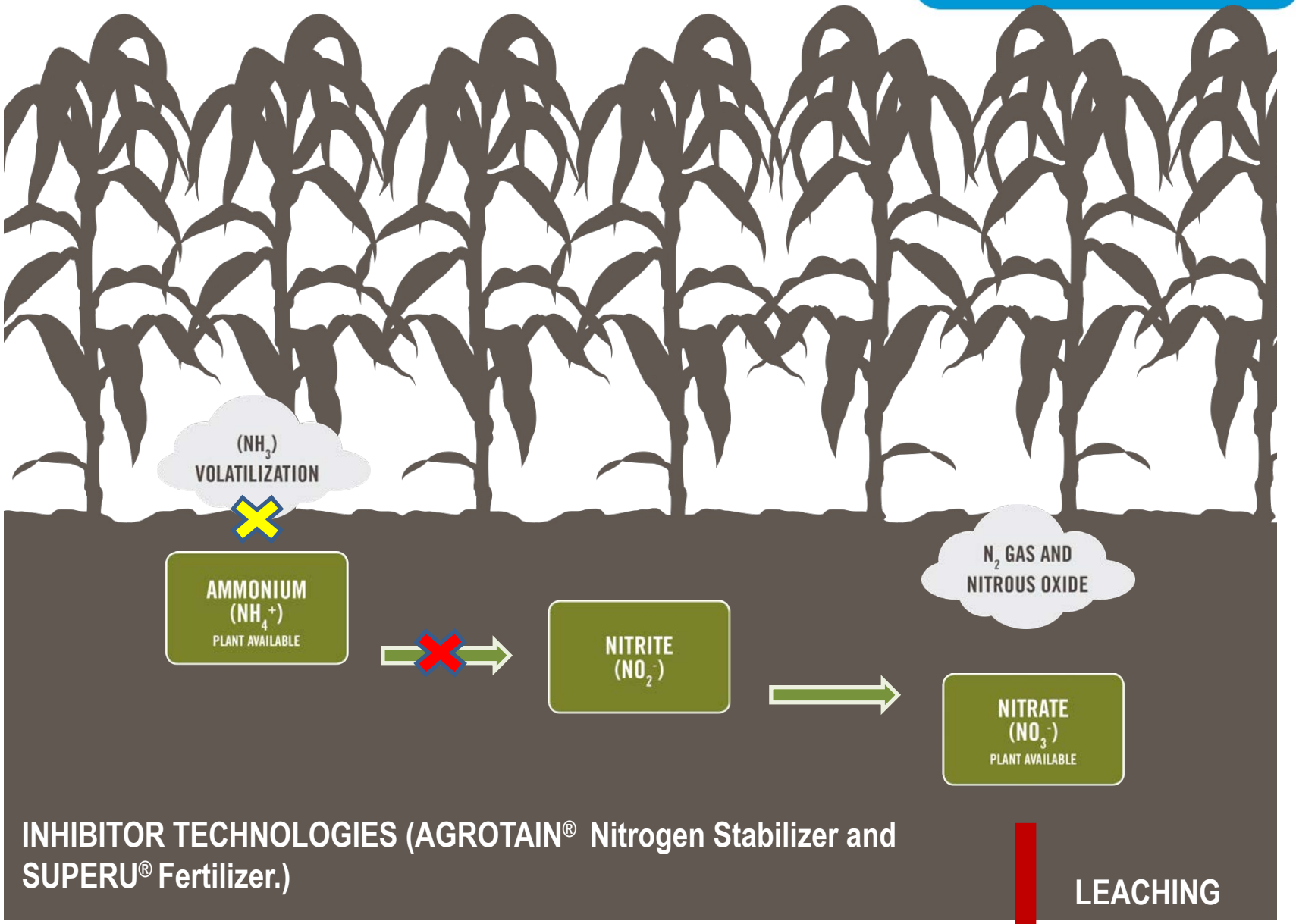


- Coated Urea Technology – <u>stores</u> nitrogen inside the coating

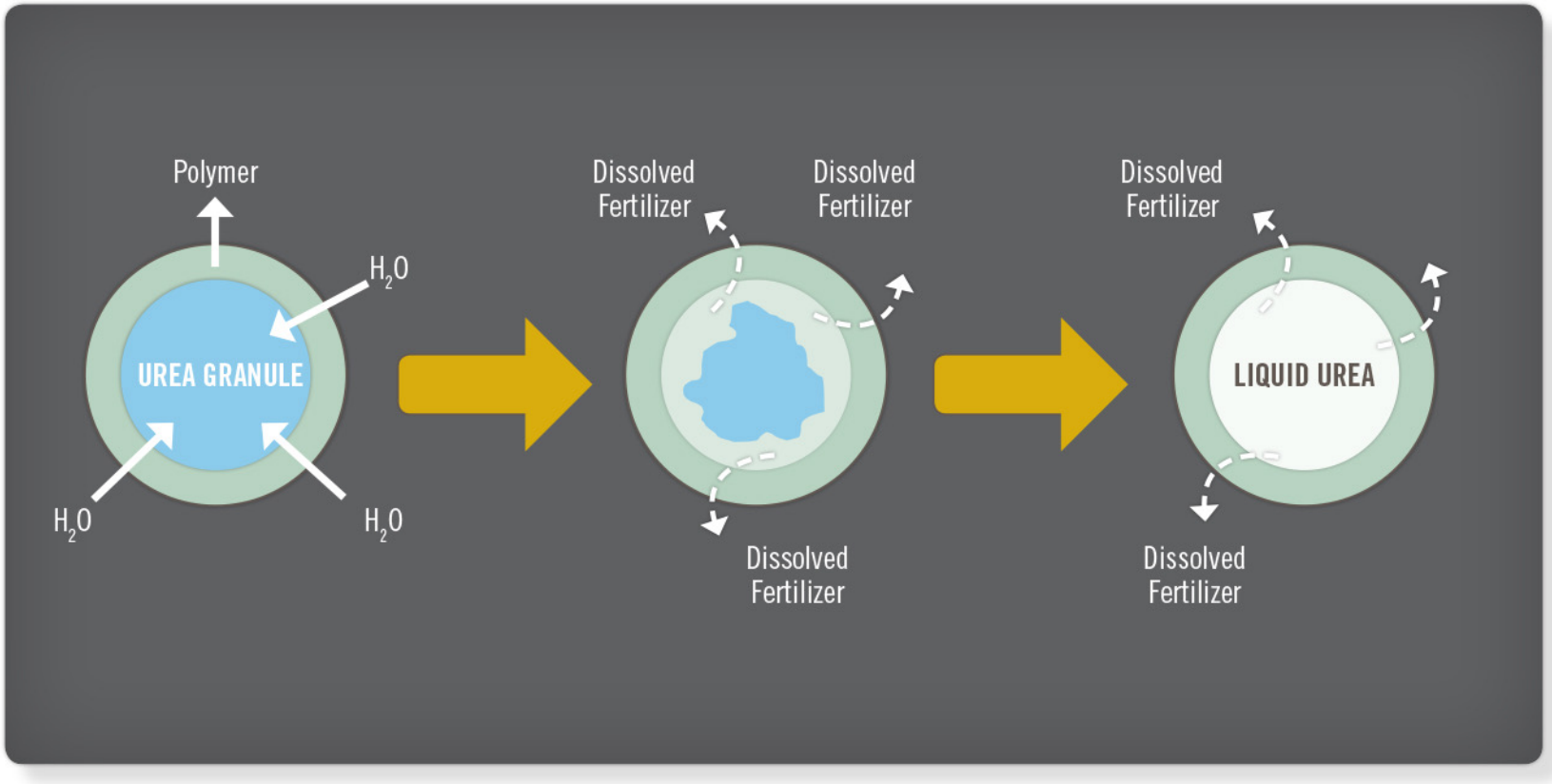


- Methylene Urea Technology – <u>stores</u> nitrogen in a chain that microbes break down

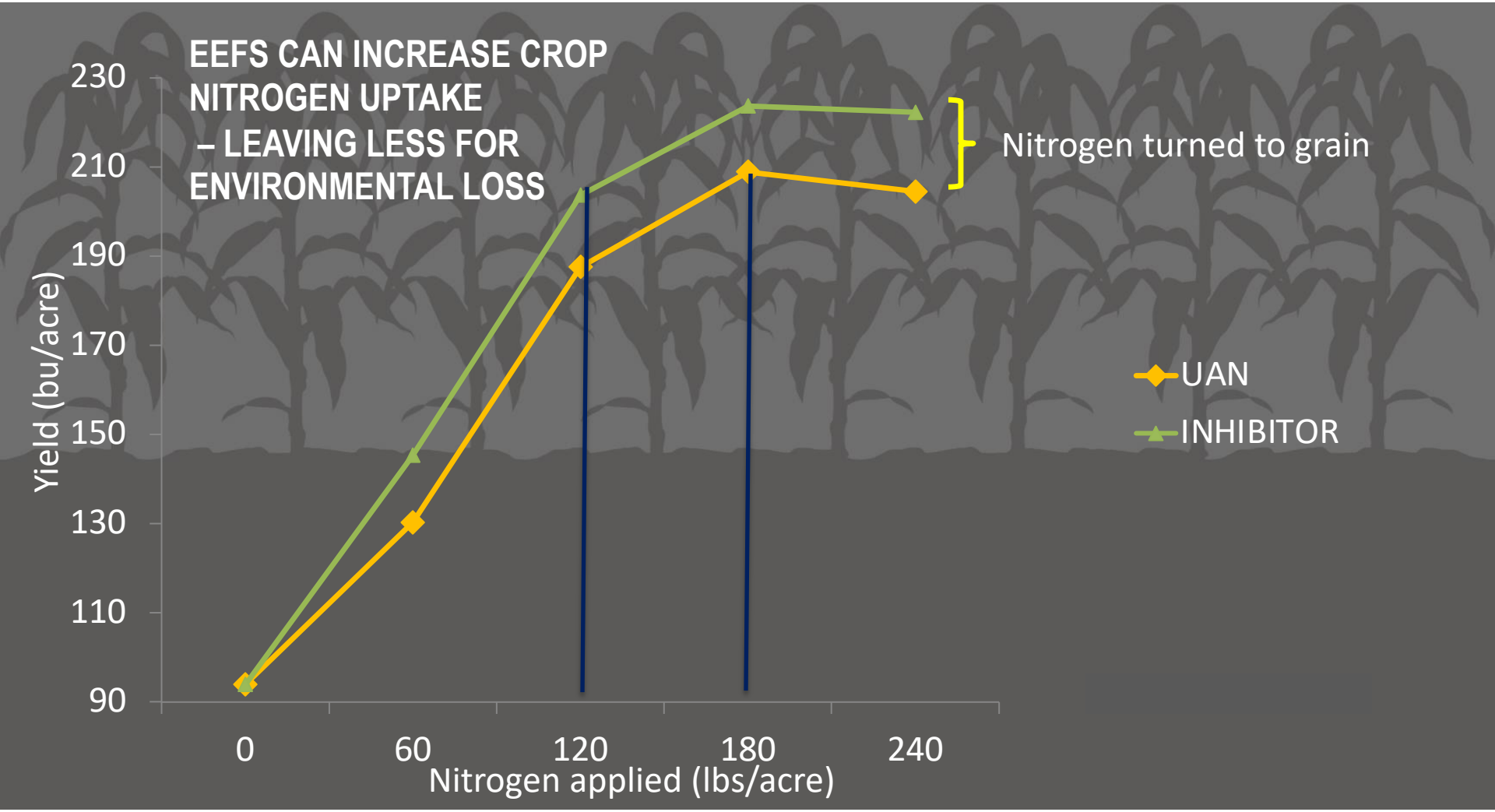



(NH_3)
VOLATILIZATION
AMMONIUM
(NH_4^+)
PLANT AVAILABLE
NITRITE
(NO_2^-)
N_2 GAS AND
NITROUS OXIDE
NITRATE
(NO_3^-)
PLANT AVAILABLE
INHIBITOR TECHNOLOGIES (AGROTAIN® Nitrogen Stabilizer and SUPERU® Fertilizer.)
LEACHING

CONTROLLED RELEASE: POLYMER-COATED UREA



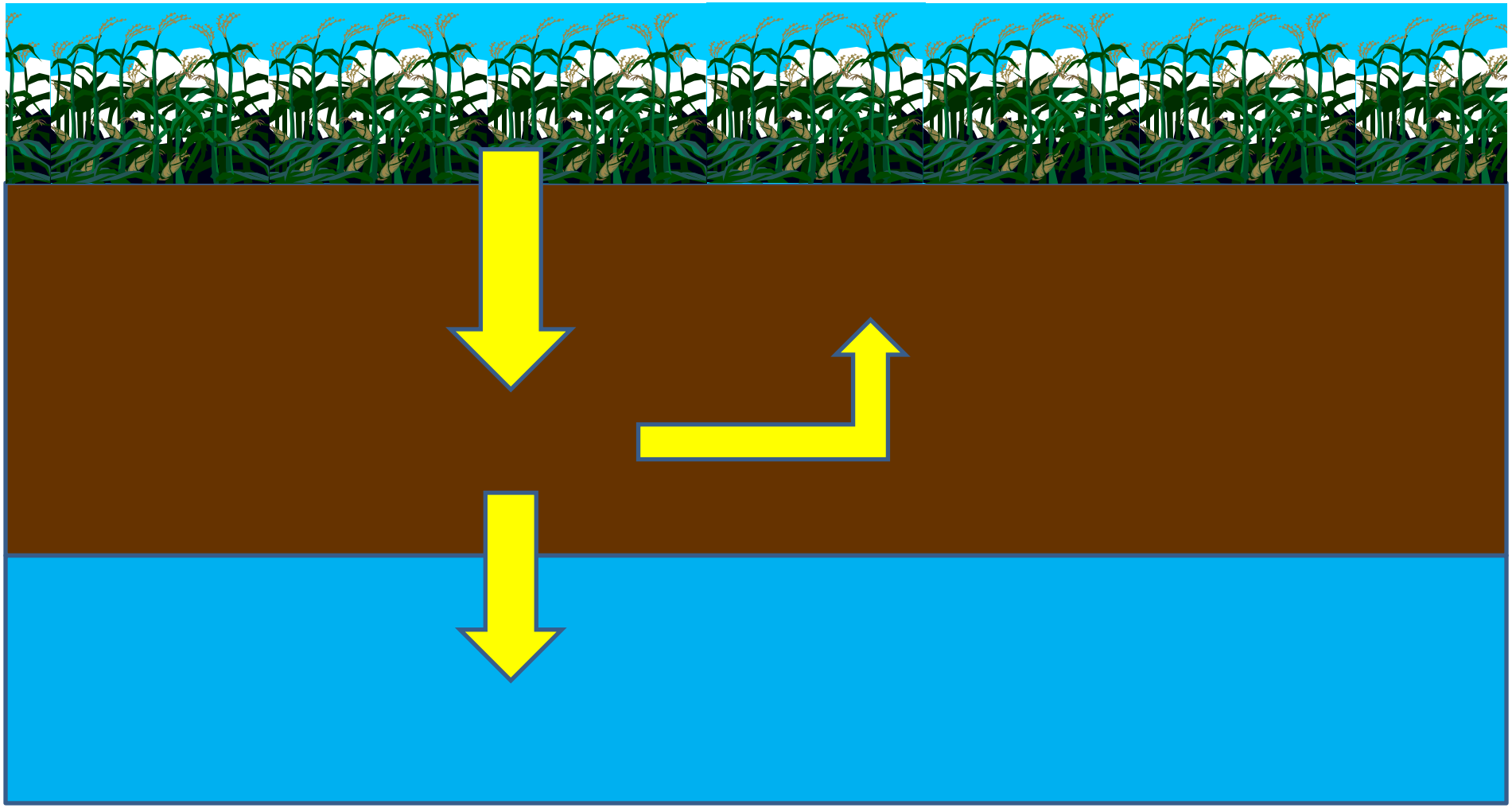
Example: DURATION CR® fertilizer



Source: Vetch, University of Minnesota, 2013

Neither the University of Minnesota nor the individual researchers referenced, endorse or recommend any product or service.

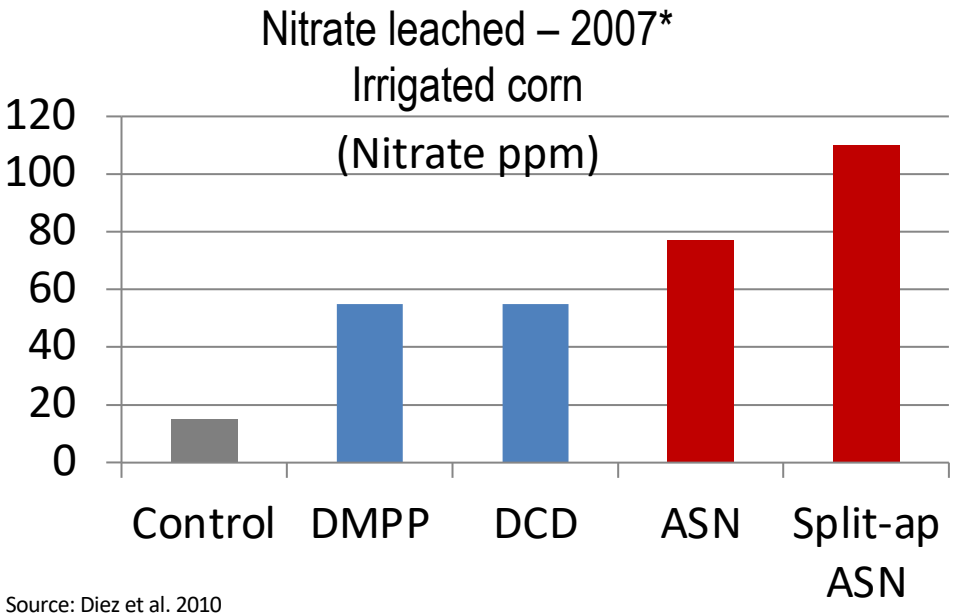
INCREASING WATER QUALITY WITH EEFS



EEFS IN THE MARKETPLACE

Example: Farmer historically applies 180 lbs N/acre

- Nitrogen = $50/acre
- $75,000 (1500 acres)
- EEF's $10 - $30/acre
- Need 3-8½ bu yield increase to break even

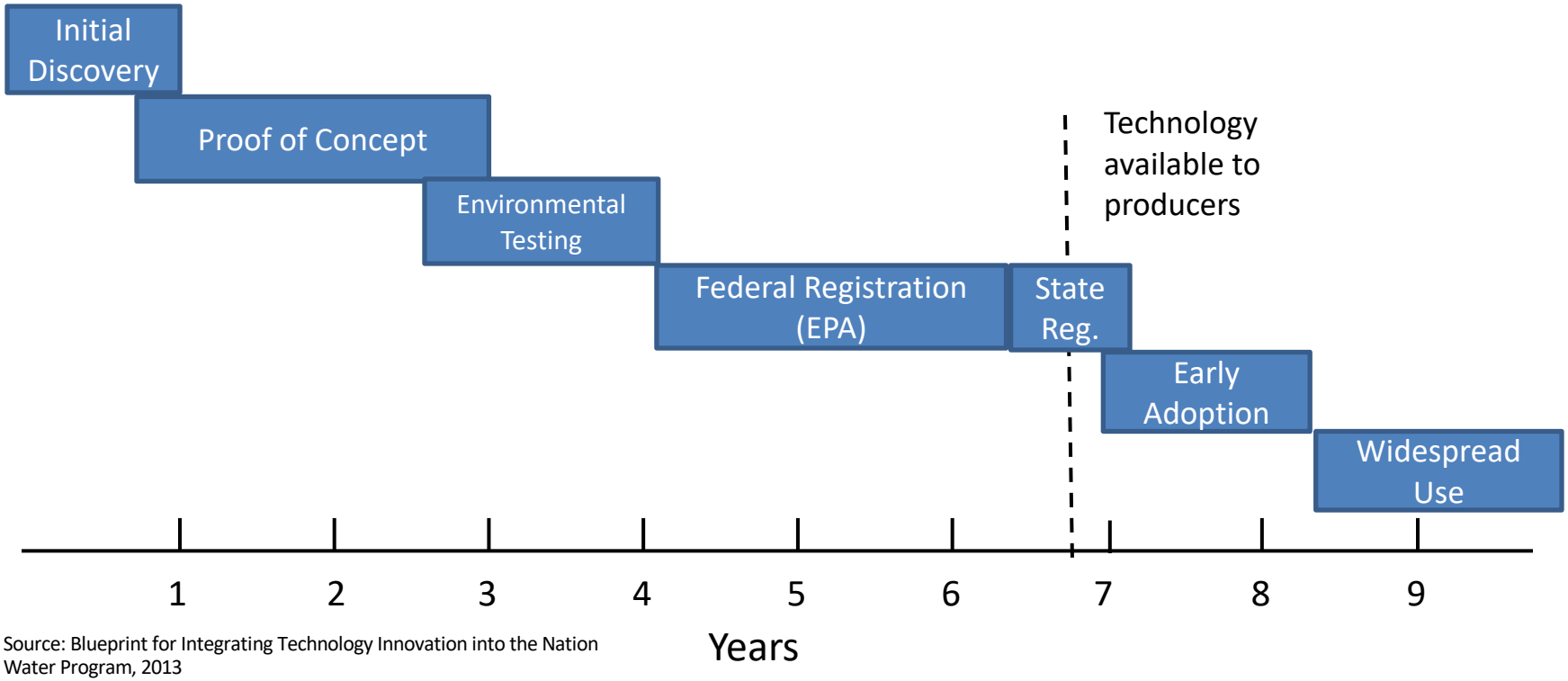


Source: Diez et al. 2010

CASE STUDY – FIFRA REGISTRATION

"Technology providers describe a complex system of federal, state and local requirements that discourages acceptance, adoption and use."

Pathway to achieving environmental benefits for FIFRA regulated products



Source: Blueprint for Integrating Technology Innovation into the Nation Water Program, 2013

THANK YOU

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