• International scientific and professional society
• Professional home for:
  – 7,500 members
  – 13,000+ certified professionals (CCAs and CPAs)

More on ASA later
Agronomic Technology in the Field

Genetics

Photo by Bill Pan

Water flow map

Adapt-N
A tool for adaptive nitrogen management in corn

News and events

Encirca™ Yield Stand and Nitrogen Management

Top Product of the Year

November 1, 2012

Home About Adapt-N Manual News & Events Publications & Resources

Adapt-N chosen 2012 Top Product of the Year
Adapt-N was selected as the Best New Product of the Year 2012 by AgProfessional magazine, the publication related to agronomic and business management for agricultural retailers/distributors, input managers and crop consultants. Adapt-N took a huge 92 percent of the vote, and it is the first time a commercial organization received the award. The...
Global Food Security (70% increase by 2050)

• Stacking ag technologies could by 2050
  • Increase global crop yields as much as 67%

• Key technologies:
  • Conservation ag
  • Integrated fertility management
  • Improved crop protection
  • Improved irrigation
  • Precision ag
National Average Corn Yields - USA

70% by 2015 requires 3.2 bu/A/yr

Corn grain yield, bu/A

- 1.8 bu/A/yr
- Soil testing, balanced NPK fertilization, conservation tillage
- Double-X to single-X hybrids
- Expansion of irrigated area, increased N fertilizer rates
- Transgenic (Bt) insect resistance
- Auto-steer
- Precision, high-speed planters
- Integrated pest management

Updated w/ permission: Cassman et al., 2006
Yield Gap for Corn in Eastern South Dakota

Grain Yield, bu/A

SDSU Variety Testing

3.9 bu/A/yr

5 bu/A

51 bu/A

2.9 bu/A/yr

NASS Eastern SD

Clay et al., 2014
National Corn Growers Assoc.
Yield Contest Winners

David Hula: Charles City, VA
2015  532 bu/A
2014  476 bu/A

Randy Dowdy: Valdosta, GA
2014  504 bu/A

Efficient use of inputs and appropriate practices without sacrificing yield potential:
A CHALLENGE

Tollenaar, 1985
U of Guelph
“Therefore, my guess for the current upper limit of corn productivity at a Corn-Belt location is 500 bu/A.”
Meeting nutrient demand through increasingly variable growing seasons

Bender et al., 2013.
Phosphorus sample distribution: South Dakota

- 2001; 17,476
- 2005; 34,188
- 2010; 81,323
- 2015; 158,470

... and variable soil fertility

OM (N)

Potassium sample distribution: South Dakota

- 2001; 17,806
- 2005; 33,730
- 2010; 67,426
- 2015; 133,310

Relative Frequency, %

Bray and Kurtz P1 equivalent soil test level, ppm

Ammonium acetate equivalent soil test level, ppm

Relative Frequency, %
Technology in Research

CRISPR/Cas9

Repair dsDNA

NHEJ

Donor DNA

Particulate organic matter (POM)

Microorganisms

Layer silicate clay

Extracellular polysaccharide

Humified organic matter

Image by ML Thompson
Can’t manage what we can’t measure ... improving in both research & in practice
Data has become a huge part of agronomic practice
... and is becoming a more visible component of agronomic science
Fake News ... Fake Science
Entertaining video illustrating the need for science to be more evidence-based.
Evidence-based Agronomy

Transparent integration of:

- **Relevant scientific data** and resulting recommended practices
- **Local** conditions and associated data

- **Relevant data**: past and present; near and far
- **Systematic analysis** of factors that influence practice performance
- **Site-specific recommendations** based on those factors
A traditional fertilizer recommendation paradigm

Soil test level
Yield goal
(Soil type)
(Placement)

Application rate

Concealed in the box:

Calibration data
Other data
Data manipulation
Tradition & philosophy
Assumptions

Fixen, 1992
Evidence-based Soil Test Calibration in Australia

“Better Fertilizer Decisions for Cropping Systems (BFDC)”

- Searchable data repository
- 6,000 trial treatment series
- N, P, K, S for multiple crops
- Nation wide, shared work & funding
Wheat response to P fertilizer in Australia

“Better Fertilizer Decisions for Cropping Systems (BFDC)”

Effort underway for a similar system for the U.S.
Technology is merging the world of the scientist with the world of the practitioner.
“The participation of non-scientists in the process of gathering, using, and interpreting data”
U.S. Corn Belt Example: “Learning Blocks”

- Software automates placing replicated, randomized plots in specific zones within fields
- Utilizes GPS for treatments & response measurement
- Can generate massive controlled comparisons very quickly ... BIG DATA
- Better define cause & effect ... help convert data to knowledge

Citizen science may well become a significant part of agronomy’s future ... your future
Bill Gates: These are my favorite books of 2016

Never before have I felt so empowered to learn as I do today. When I was young, there were few...

---

When Data Lies

Published on November 29, 2016 | Featured in: Big Data, Student Voices

Connor Thompson | Follow
Student at the University of California, Los Angeles

Article comment by Angela Ignam Mathon
Head of Group HR Analytics at HSBC
“Data doesn't lie, the storyteller does.”
A traditional fertilizer recommendation paradigm

Be prepared to operate inside the recommendation box

Fixen, 1992

- Soil test level
- Yield goal
- (Soil type)
- (Placement)
- Application rate
- Calibration data
- Other data
- Data manipulation
- Tradition & philosophy
- Assumptions
Consumer influence on how we grow food and its footprint
That leads these young nosy bodies to want to know everything about their food, including how it is grown and who is behind how it is grown. "What you eat is not just about your diet, but who you are, what you are about and how others see you."

Eve Turow Paul explains to a group of commodity buyers and sellers how the millennial generation sees food compared to older generations.
Field to Market™

Field Print Calculator

<table>
<thead>
<tr>
<th>Year</th>
<th>2000 *</th>
<th>Unit - per Bushel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>0.008</td>
<td>Planted Acres</td>
</tr>
<tr>
<td>Soil Erosion</td>
<td>0.038</td>
<td>Tons</td>
</tr>
<tr>
<td>Irrigation Water Applied</td>
<td>0.242</td>
<td>Acre Inches</td>
</tr>
<tr>
<td>Energy</td>
<td>47.779</td>
<td>Btu</td>
</tr>
<tr>
<td>Greenhouse Gases</td>
<td>13.6</td>
<td>Pounds $CO_2$e</td>
</tr>
</tbody>
</table>

* Five-year average 1996 - 2000

Note: Data are presented in index form, where the year 2000 = 1 and a 0.1 point change is equal to a 10% difference. Index values allow for comparison of change across multiple dimensions with differing units of measure.
Success in agriculture is increasingly defined by a diverse set of metrics.
We need to be prepared ...

- To participate in the **new agronomy** that merges science and practice

- To keep clients ready to meet consumer demands and the resulting opportunities

**How??**

- Capitalize on the CCA program
- Fully embrace 4R Nutrient Stewardship
• Launched in 1992 ... 1st exam in 2/93
  – Passing rate was less than 50%

• South Dakota
  – 1st Board meeting in June of 1994
  – 1st SD exam in Feb 1995 in Mitchel
  – 1st class of SD CCAs = 99
  – 3,400 CCAs in the US

Proud to be on the passing side!
First SD CCA Board (voting members) - 1994

Brad Bervin, SD Dept. of Ag.
Fred Cholick, SDSU
Paul Fixen, PPI (Pres.)
Jeff Hemenway, NRCS
J.D. Lynd, Ag Unity
Craig Myron, Vermillion Fert. (V. Pres.)
Robert Narem, Soil Consultants, Inc.
Greg Powell, DENR
Larry Tidemann, SDSU-Extension (Sec.-Tres.)
Pat Tracy, JES Farms
What’s changed since those early days?

• Primary motivation for certification
  – Early days (Fixen opinion):
    • Fear of government requirements for program participation
    • To catch up with other professions
    • To expand education opportunities and professional growth
    • To recognize knowledge based skills, not just degrees
  – Today, CCA has defined a profession through standards ... creates:
    • Creditability - Professionalism
    • Opportunities - Jobs, advancement
    • Motivation - Continuing education & Ethics
    • Ability - Performance
    • Validation - Peers

• Numbers and geography

Even greater importance in the future
CCA and CPAg Program Participants, 2000-2016

Certified (2016)

- CCAs 13 241
- CPAGs 512
- CCA Retired 162
- CPAg Retired 20
- CCA Candidates 133
2016 CCA & CPAg Program Participants

Total Certified
CCAs 13,241
CPAgs 512
CCA Retired 162
CPAg Retired 20
CCA Candidates 133
New CCA Specialties (need to be a CCA first)

• 4R Nutrient Management Specialist (4R NMS) (Aug 2015)
• Sustainability Specialist (SSp) (Aug 2016)
• Resistance Management Specialist (RMS) (Aug 16)
CCA - 4R Nutrient Management Specialist

• For CCAs who concentrate their work in nutrient management
• Allows such CCAs to become more visible & recognized for their knowledge & skills that can support growers in meeting the need for improved water quality & environmental stewardship
• Strongly supported by TFI, FC, IPNI, USDA, EPA
CCA - 4R NMS Proficiency Areas (All focused on 4Rs)

- Nutrient Management Planning
  - 4 competency areas
- Nitrogen
  - 5 competency areas
- Phosphorus
  - 5 competency areas
- Potassium, Secondary & Micronutrients
  - 4 competency areas
- Manure Management
  - 3 competency areas
Why does agriculture need the 4R NMS?

• To generate a metric showing intensified effort on reducing environmental impacts
• But with an approach that integrates impacts of practices on both economics & the environment
  – all considered at the local field level

• Unintended consequences: market place added value
  – Farmer liability insurance – court cases in WI, ID, IA
    • Manure classified as a pollutant (WI)
    • Underwriter – would not insure farms unless CCA writes the plan
    • CCA with 4R NMS receives $1,000 premium reduction on professional liability coverage (ex: $3,500 down to $2,500)
Nutrient Stewardship Metrics for Sustainable Crop Nutrition

**Enablers (process metrics)**
- Extension & professionals
- Infrastructure
- Research & innovation
- Stakeholder engagement

**Actions (adoption metrics)**
- Cropland area under 4R (at various levels)
- Participation in programs
- Equity of adoption (gender, scale, etc.)

**Outcomes (impact metrics)**
- Food & nutrition security
- Productivity
- Nutrient use efficiency
- Land quality, soil health
- Air & water quality
- Economic value
- Land conservation, natural habitat
It's about balance ... advancing multiple objectives.
Adding SD to the 4R NMS list …

• ICCA goal is for availability in all states
• SD CCA Board
  – **Contact: Kathy Zander:** kathy@sdaba.org; 605-224-2445
• ICCA ASA Rep for SD
  – **Lacey Edwardson:** ledwardson@sciencesocieties.org; 608-268-4953
Preparing for the
Certified Crop Adviser
4R Nutrient Management
Specialist Exam

Due to be available
to prepare for the
February 3 exam

Support from IPNI
Example of 4Rs at work

Farm Description: 1,500 acres of alfalfa, corn, soybeans and wheat complement cow-calf, feedlot operations

GROWER:
Joel Erickson (right)

LOCATION:
Langford, South Dakota

RETAIL FACILITY:
South Dakota Wheat Growers

CROP ADVISOR:
Andrew Kappes (left)

RETAILER LOCATION:
Langford, South Dakota
• What is your professional home?
• Do you have one?
• Should you have one?
Mission: To empower scientists, educators, and practitioners in developing, disseminating, and applying agronomic solutions to feed and sustain the world.
ASA ... Your Professional Home

• **Cost:** $100/yr

• **Benefits**
  – **Networking:** Access to leading researchers, educators, and practitioners from across NA (communities; member directory)
  – **Continuing education package** for online CEUs (under development & testing)
  – **Influence** on programming – meetings, webinars, pubs
    • ASA is changing ... in your direction
  – **CSA News** (monthly magazine for all 3 societies)
  – **Digital library** for additional cost of $105/yr
    • **All** pubs: journals, books, etc. – past & present
  – **Reduced registration** fee for annual meeting
For more information ...

http://www.ipni.net/

https://www.agronomy.org/certifications

https://www.agronomy.org/