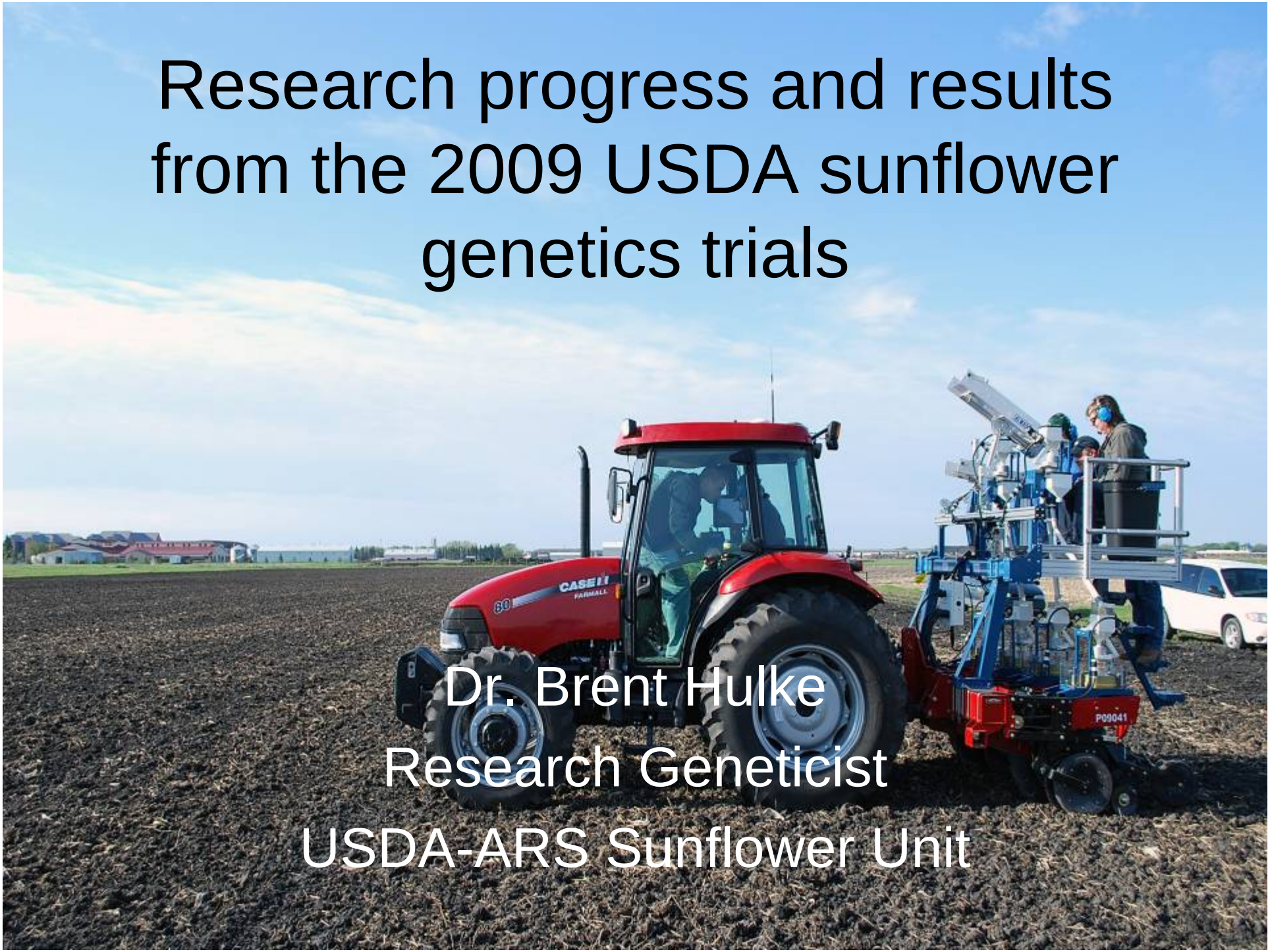
Research progress and results from the 2009 USDA sunflower genetics trials



Dr. Brent Hulke
Research Geneticist
USDA-ARS Sunflower Unit

Outline

- New equipment – action photos
- New people
- New field sites
  - Latest results from field trials
- Questions / comments

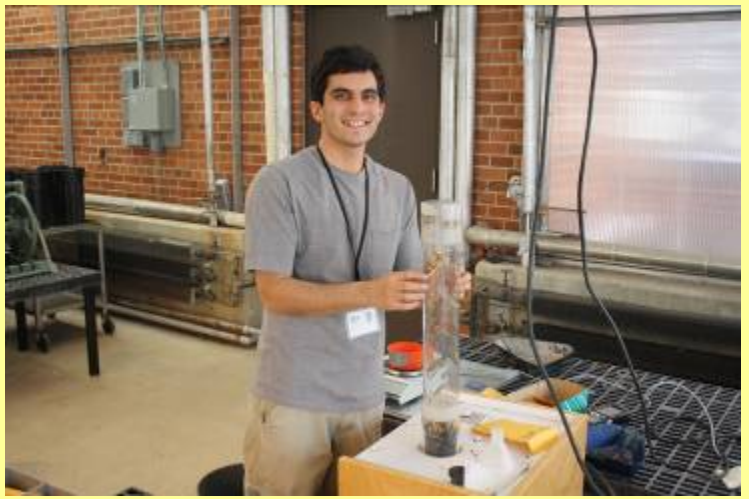

JOHN DEE


KINCAID
8-XP

Improvement in data quality

- Commercial yield trial at Casselton
  - Coefficient of variation -- Yield
    - 2007: oilseed 17.1%, confection 19.3%
    - 2008: oilseed 13.5%, confection 12.7%
    - 2009: oilseed 11.1%, confection 11.1% AND planting and harvest done in less than half the time
- Some of our trials had CVs approaching 9.0% this year.

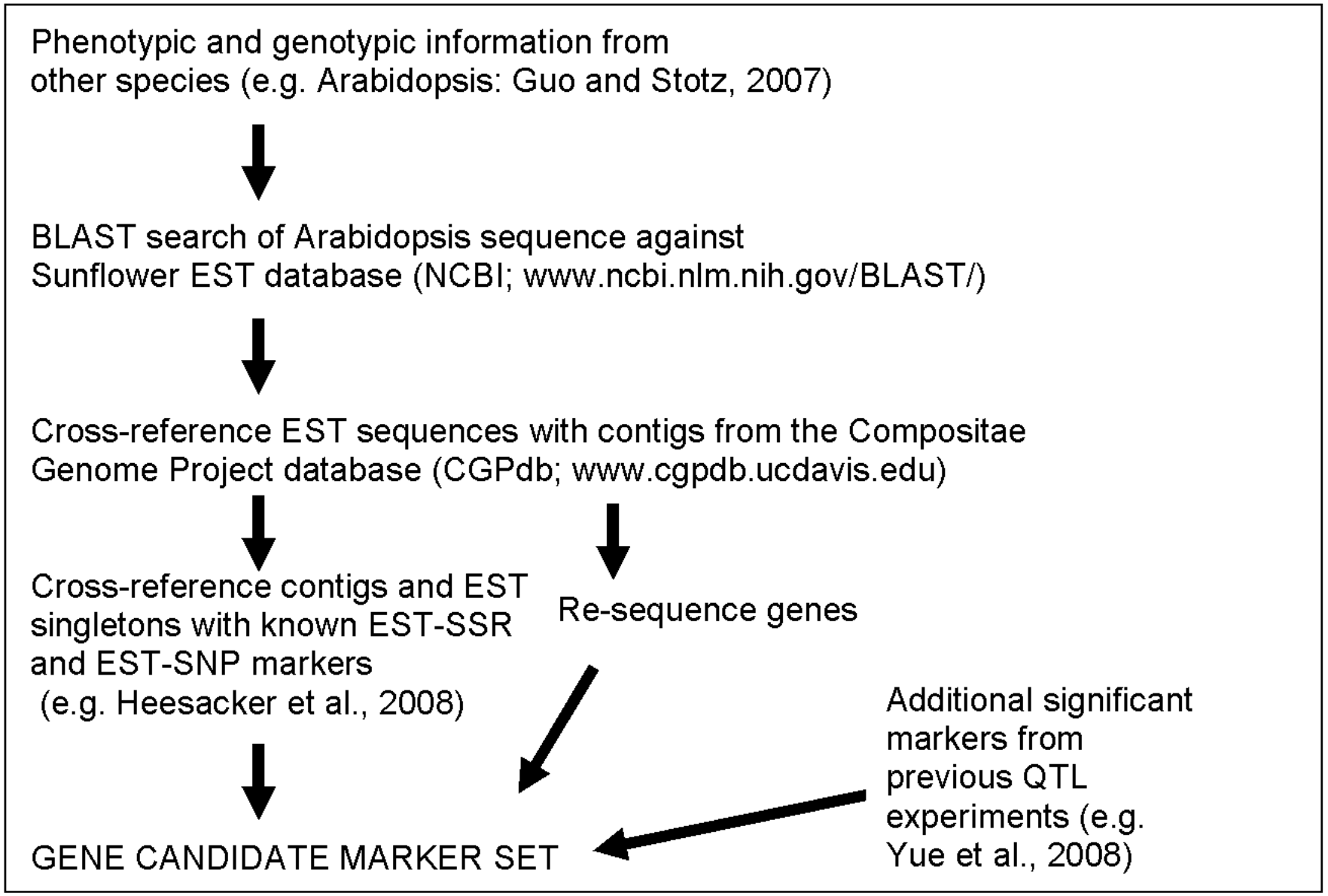
New people

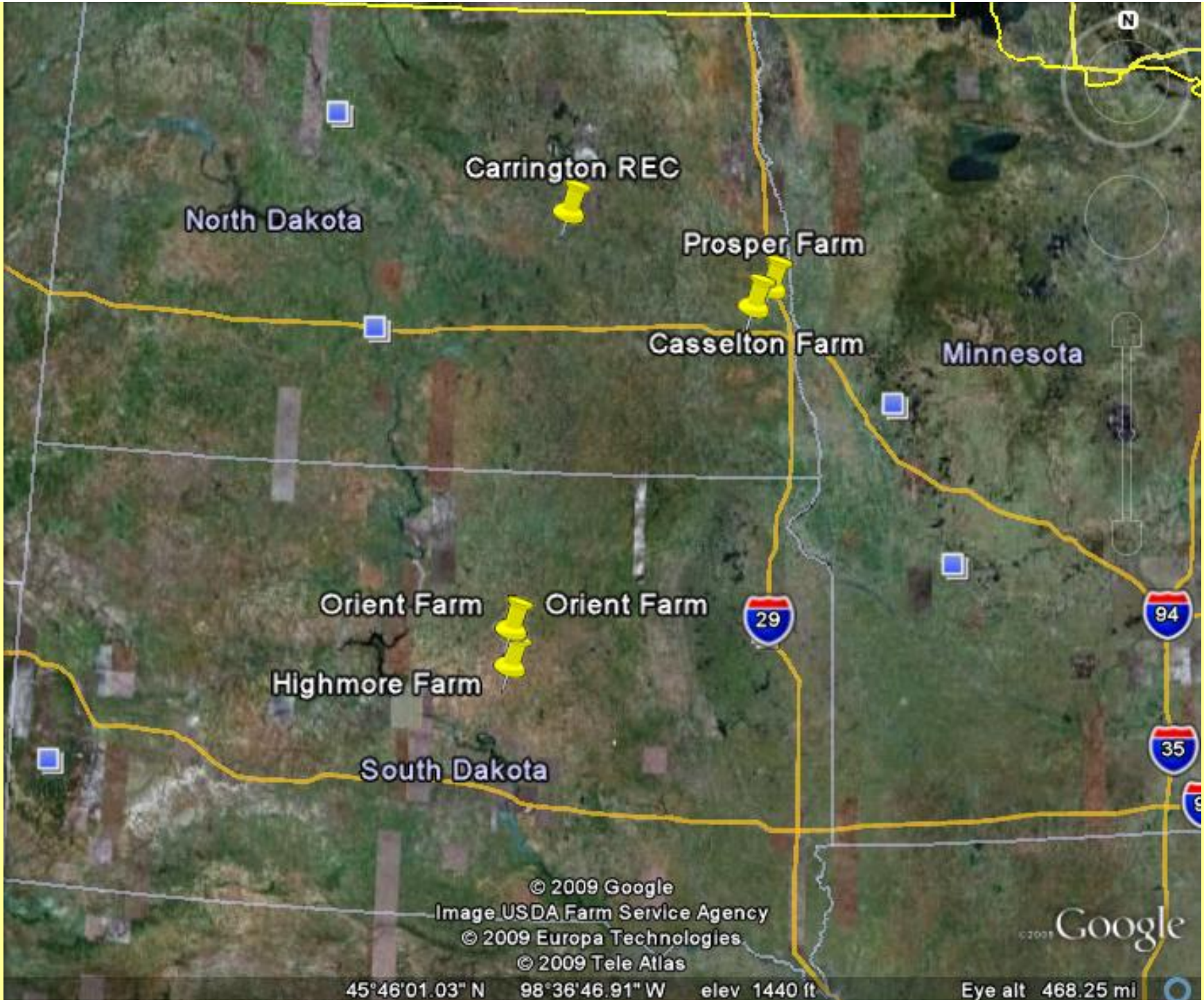


- Arun Jani – technician
- With us since July 2009
- Univ of Hawaii graduate
- Former Peace Corps dryland crops agronomist in Senegal, Africa

New people

- Dr. Zahirul Talukder (Zahir)
- With us since September 2009
- Sclerotinia Initiative postdoc
- From Bangledesh, with training in the UK and Canada in plant breeding and molecular genetics
- Emphasis on MAS and association mapping of Sclerotinia resistance


Phenotypic and genotypic information from other species (e.g. Arabidopsis: Guo and Stotz, 2007)
BLAST search of Arabidopsis sequence against Sunflower EST database (NCBI; www.ncbi.nlm.nih.gov/BLAST/)
Cross-reference EST sequences with contigs from the Compositae Genome Project database (CGPdb; www.cgpdb.ucdavis.edu)
Cross-reference contigs and EST singletons with known EST-SSR and EST-SNP markers (e.g. Heesacker et al., 2008)
Re-sequence genes
Additional significant markers from previous QTL experiments (e.g. Yue et al., 2008)
GENE CANDIDATE MARKER SET


Carrington REC
North Dakota
Prosper Farm
Casselton Farm
Minnesota
Orient Farm
Orient Farm
Highmore Farm
South Dakota
29
94
35
© 2009 Google
Image USDA Farm Service Agency
© 2009 Europa Technologies
© 2009 Tele Atlas
45°46'01.03" N 98°36'46.91" W elev 1440 ft
Eye alt 468.25 mi
Google

List of traits studied

- Work is mostly in oilseed with some ventures into confection
- Disease resistance
  - Sclerotinia resistance
  - Downy mildew resistance – mostly stacking with Sclerotinia and other traits
  - Rust resistance stacked with Sclerotinia resistance
  - Early work on Verticillium resistance (pending results from Sam Markell and associates on VCGs)

List of traits studied

- Insect resistance
  - Banded sunflower moth resistance
  - Red sunflower seed weevil resistance
  - Sunflower moth resistance
  - Stem weevil resistance
- Low Saturated fat
- Diversification of sunflower germplasm
- Perennial sunflower as a bird trap crop

Steve Knapp's Hopi population

Min. : 367.9

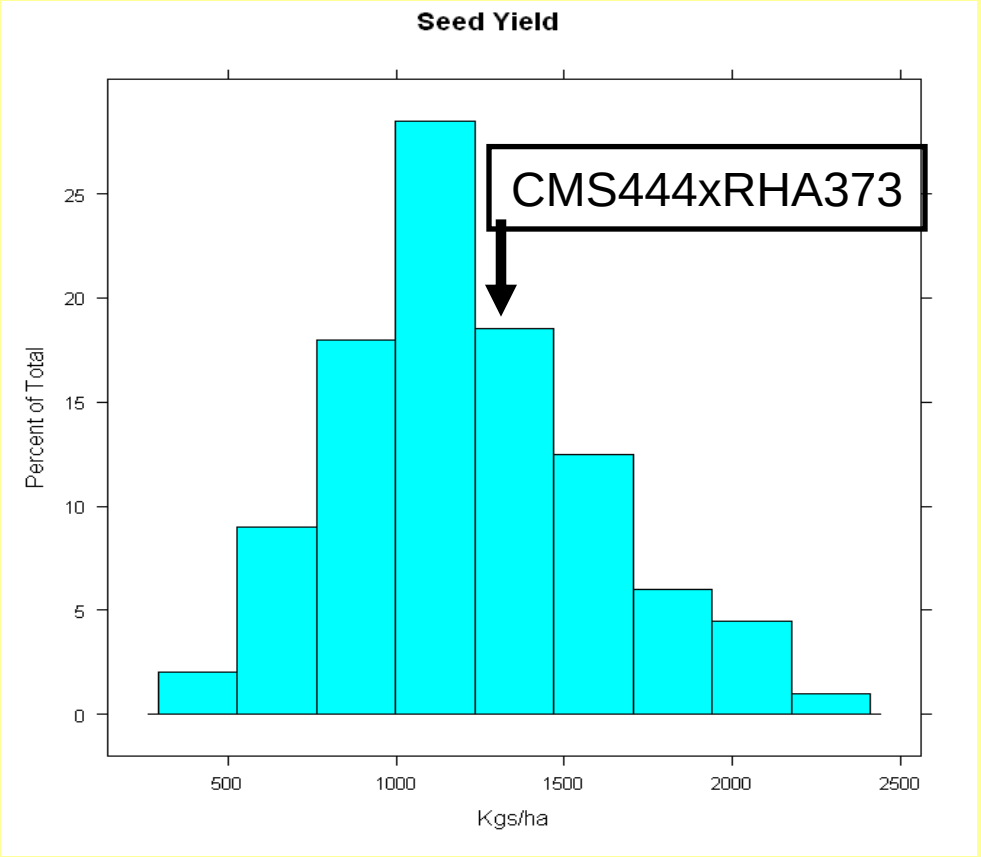
1st Qu.: 924.7

Median :1177.8

Mean :1206.2

3rd Qu.:1426.7

Max. :2334.2



CMS444xRHA373=1365 kgs/ha

30% of RILs better than the elite CMS44xRHA373 hybrid

Best commercial check=2284 kgs/ha

One RIL better than the best commercial check hybrid

Banded Sunflower Moth

- Tested at Casselton and Prosper
- Two-row yield plots in TC1 or F4 testcross
- All lines were crossed to RHA 377 as the common male line

Results at Casselton

Hybrid	Traits	Yield (lbs/A)	Oil (%)	2007 BSM (%)
09GH241	Scl, BSM	2894	42.4	12.2
8H350	DM	2793	40.4	--
09GH305	Scl, HO, BSM	2500	40.7	8.0
09GH239	Scl, BSM	2490	40.2	9.4
09GH199	Scl, DM, BSM	2477	35.9	8.0
Range		1140-2894	31.7-42.4	2.2 – 72.0

Red Sunflower Seed Weevil

- Tested at Casselton and Highmore, SD
- Two-row yield plots in TC1 or F4 testcross
- All lines were crossed to RHA 377 as the common male line

Results at Casselton

Hybrid	Traits	Yield (lbs/A)	Oil (%)	2008 SW (%)
09GH349	Scl, DM, HO, RSSW	3000	37.5	14.0
09GH387	Scl, RSSW	2961	42.2	5.3
8H350	DM	2711	41.6	--
09GH397	Scl, RSSW	2605	41.4	7.3
09GH381	Scl, RSSW	2284	40.1	3.9
Range		1507 - 3000	32.6 – 43.2	1.6 – 27.0

Thanks!

- NSA / sunflower growers
- Kathy Grady and SDSU for helping with Highmore
- Pannar USA, especially Dawn Gustafson and staff, for assistance with Orient
- Dana Weiskopf, Bruce Goren, Mikey Kantar, Juan Rey, and Anitha Chirumamilla
- Undergrad students Alex Ranz, Angie Rossman, Zac Liestman, and Holly Flagg