

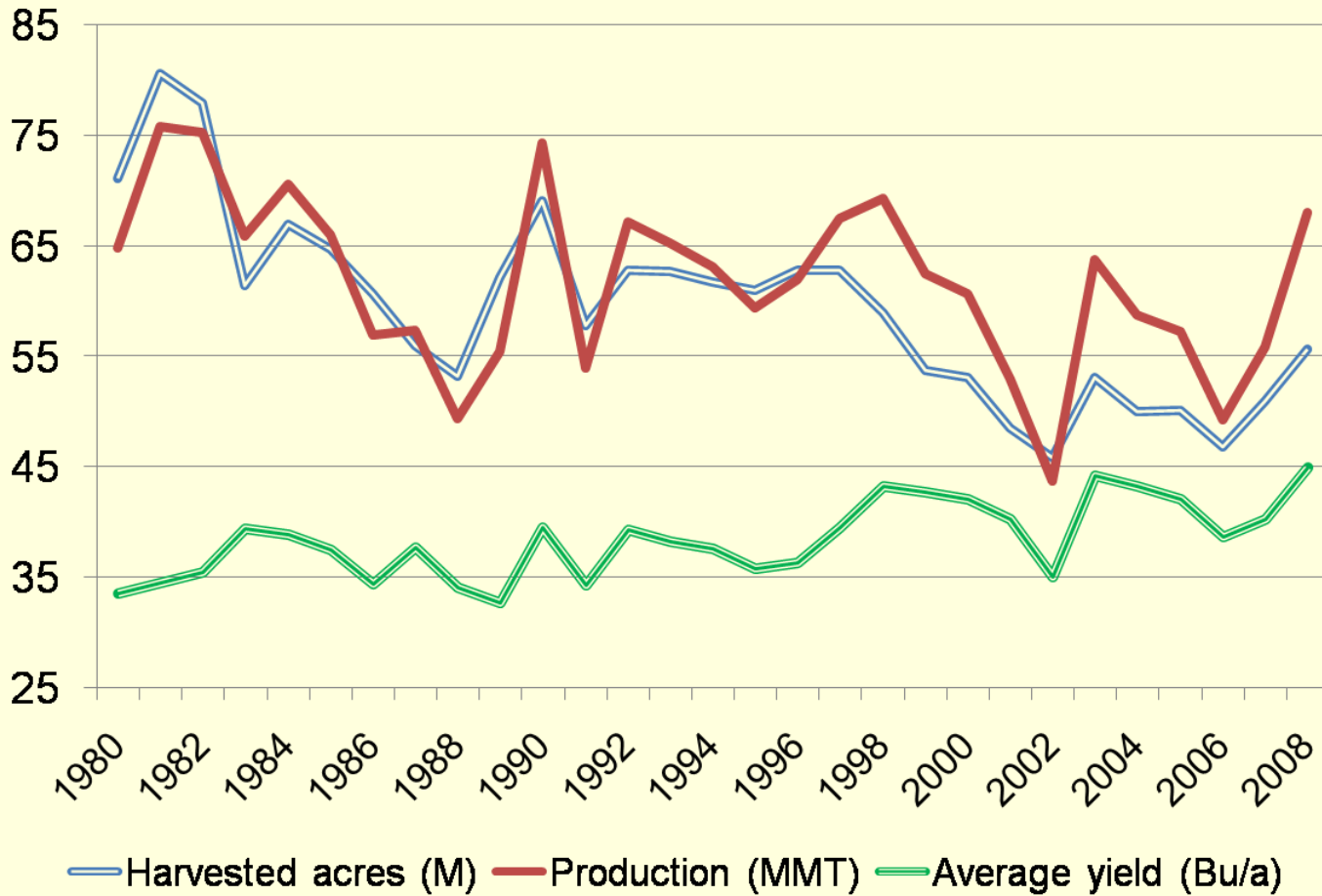


OSU Wheat Improvement: Sky's the Limit

**Annual Meeting
ESS/SAES/ARD Directors
15 September 2009**



US Wheat Production, 1980>



Wheat Rusts: Leaf, Stem, & Stripe

Leaf rust



Stem rust



Cereal Disease Lab, St. Paul, MN

Stripe rust



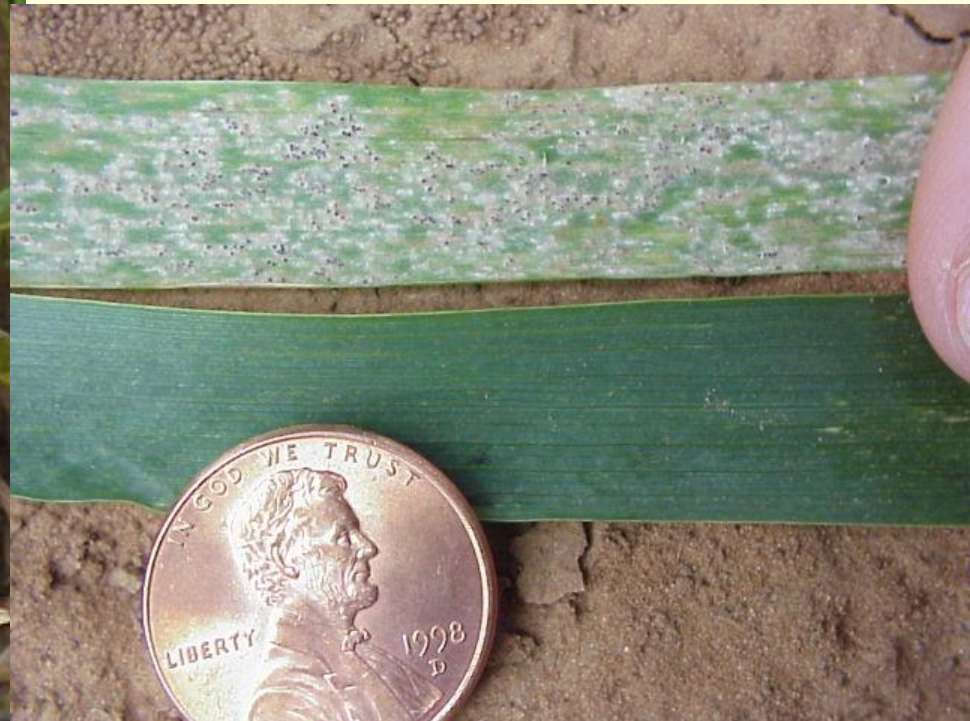


HAW

SILVER

GA #10

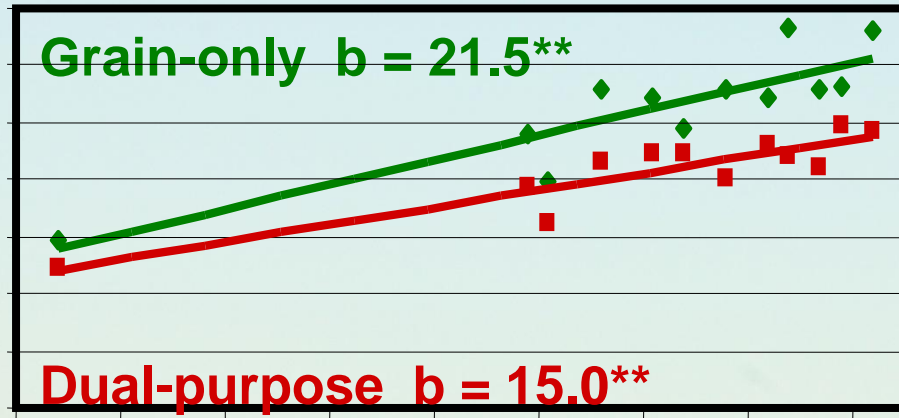
GA #9







Grain Yield



Year of Release





Wheat Improvement Research

Team Driven (OSU-
DASNR)

Product Oriented

Stakeholder Influenced

Market Guided



WIT at Work for OK Wheat

Create: **GRAZE**_n**GRAIN** breeding system

Deliver: comprehensive/multimedia extension package for optimum management & pest control

Protect: a wheat industry sensitive to perilous attacks from insects and pathogens

Enable: an expanded wheat industry

Publish: world-class journals from *Crop Science* to *Science*

Financial Support

**About 2.5 faculty FTE,
plus associated technical
support, devoted to WIT
research PLUS....**



Oklahoma Wheat Res. Foundation	\$220,000
OSU Foundation (Endowed Chair)	\$60,000
OAES M&O	\$10,000
USDA-CSREES (Special Grants)	\$30,000
Royalties (subject to change)	\$28,000

Financial Impact

Tens of millions . . .

2008 displacement:

\$18.5 M

Total displacement
in future:

\$105 M
minimum



Disease Resistance

- Characterize disease reactions of current and prospective wheat varieties
- Save OK wheat producers money by developing genetic resistance to wheat diseases
- Deliver information to producers through extension



Bob Hunger
26 years

Information Exchange

- Collect agronomic data from wheat research studies across the state
- Develop educational tools such as fact sheets, pamphlets, and web-based materials, and distribute to stakeholders

The new OSU release *OK Bullet* provides great yield potential for farmers and outstanding quality for millers and bakers

- Industry-leading milling and baking quality characteristics
- Good disease package for no-till farmers
- Resistance to soil-borne and spindle streak mosaic viruses
- Moderately resistant to current races of leaf and stripe rust
- Good yield potential
- Exceptional test weight

OK Bullet is marketed through a licensing agreement with Oklahoma Genetics Incorporated

Application for Plant Variety Protection Act Title V protection has been submitted for OK Bullet

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Executive Order 11375, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, sex, age, religion, or ability, or that of a partner in any of the policies, practices, or procedures. This notice does not limit its admission, employment, financial aid, and educational services.

Received in the presence of Cooperative Extension workers, on May 8 and 11, 2003, in cooperation with the U.S. Department of Agriculture, Robert W. H. H. Director of National Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. The publication is printed and listed by Oklahoma State University as authorized by the Director of the Division of Agricultural Sciences and Natural Resources.

Development of *OK Bullet* was made possible through a cooperative effort among the following groups and organizations

OSU Division of AGRICULTURAL SCIENCES & NATURAL RESOURCES

OGI
Oklahoma Genetics Incorporated

Oklahoma Wheat Research Foundation

Oklahoma Wheat Commission

USDA **ARS** Agricultural Research Service

OSU Wheat Improvement Team
Jeff Edwards, Brett Carver, Bob Hunger, Art Klatt, Bjorn Martin, David Porter, Patricia Rayas-Duarte, and Jeanmarie Verchot-Lubicz

www.wit.okstate.edu

OK Bullet
A new variety that zeroes in on high yield and wheat quality



Graze n Grain
Breeding System

Oklahoma Cooperative Extension Service August 2003 FT 2003-14

Jeff Edwards
5 years

Insect Resistance

- Develop IPM tools to save producers money and protect the environment
- Discover new sources of Hessian fly resistance



Kris Giles
3 years



Tom Royer
3 years



Gene Pool Enrichment

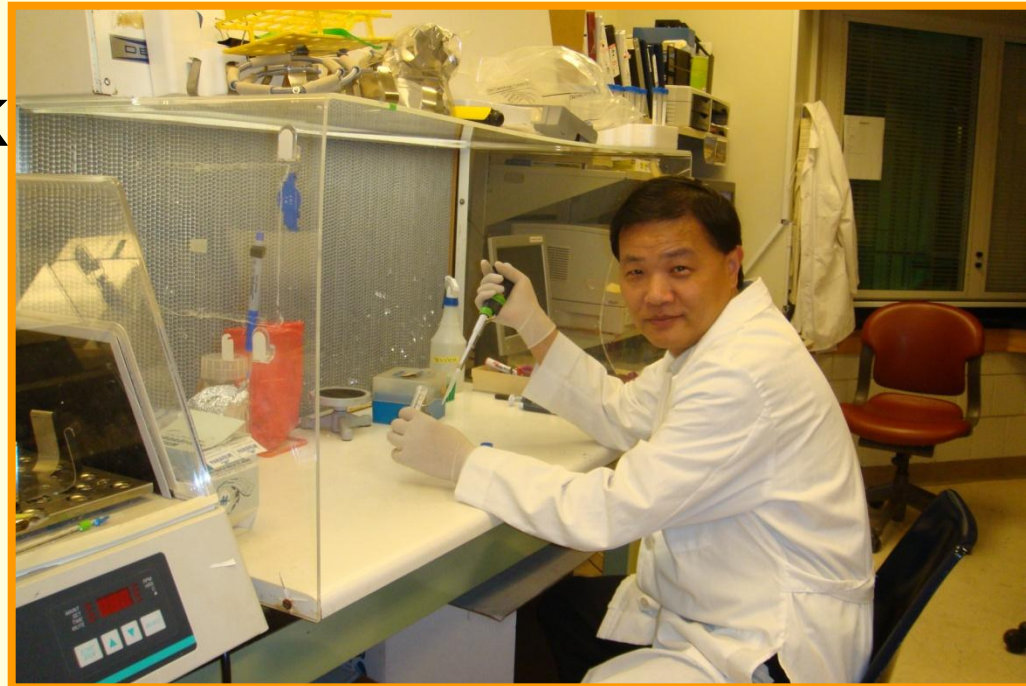
- Find new sources for genetic resistance to wheat diseases
- Use synthetic wheat to deliver genes mother nature may have left out 8,000 years ago



Art Klatt
10 years

QTL Discovery & Genomic Applications

- Find genetic markers for critical wheat traits that ensure productivity in OK
- Use MAS to speed and improve the breeding process
- Draw attention to OSU and the WIT through high-profile publications.



Liuling Yan
3 years

Drought Resistance

Develop seedling assays for coleoptile elongation under water stress



Bjorn Martin
10 years

Protein Functionality

- Develop new tools for assessing functionality of wheat that are consistent with end-user demands
- Help market the Oklahoma wheat crop by characterizing end-use quality



Patricia Rayas-Duarte
10 years

Wheat Breeding & Variety Development

- Combine the expertise of the WIT into a focused, cohesive research unit
- Produce wheat varieties tailor-made for Oklahoma
- Deliver the kind of wheat quality that customers will buy



Brett Carver
24 years

A WIT “contract”

Deliverables (Yan, FY2010)

- (1) A genetic model and molecular mechanism to explain the effects of three genes (*VRN-A1*, *PPD-D1*, and *VRN-D3*) on the timing of first-hollow-stem stage, heading, and physiological maturity in winter wheat, and a protocol for extending perfect markers for these loci to breeding populations.
- (2) A precise molecular explanation for allelic variation in powdery mildew resistance between Jagger and 2174, and a protocol for extending a perfect marker for the powdery mildew resistance gene to breeding populations.
- (3) Development and application of a PCR-based marker for resistance to leaf rust and stripe rust in OSU breeding materials and relevant cultivars.

Procedures

Deliverable 1: We have genetically mapped the variation in developmental phases associated with three major QTLs, each tightly linked with a known flowering gene, *VRN-A1* (= *AP1*) on chromosome 5A, *PPD-D1* on chromosome 2D, and *VRN-D3* (= *FT*) on chromosome 7D, in the Jagger x 2174 population . The effect of *VRN-A1* slightly. . .

Germplasm In



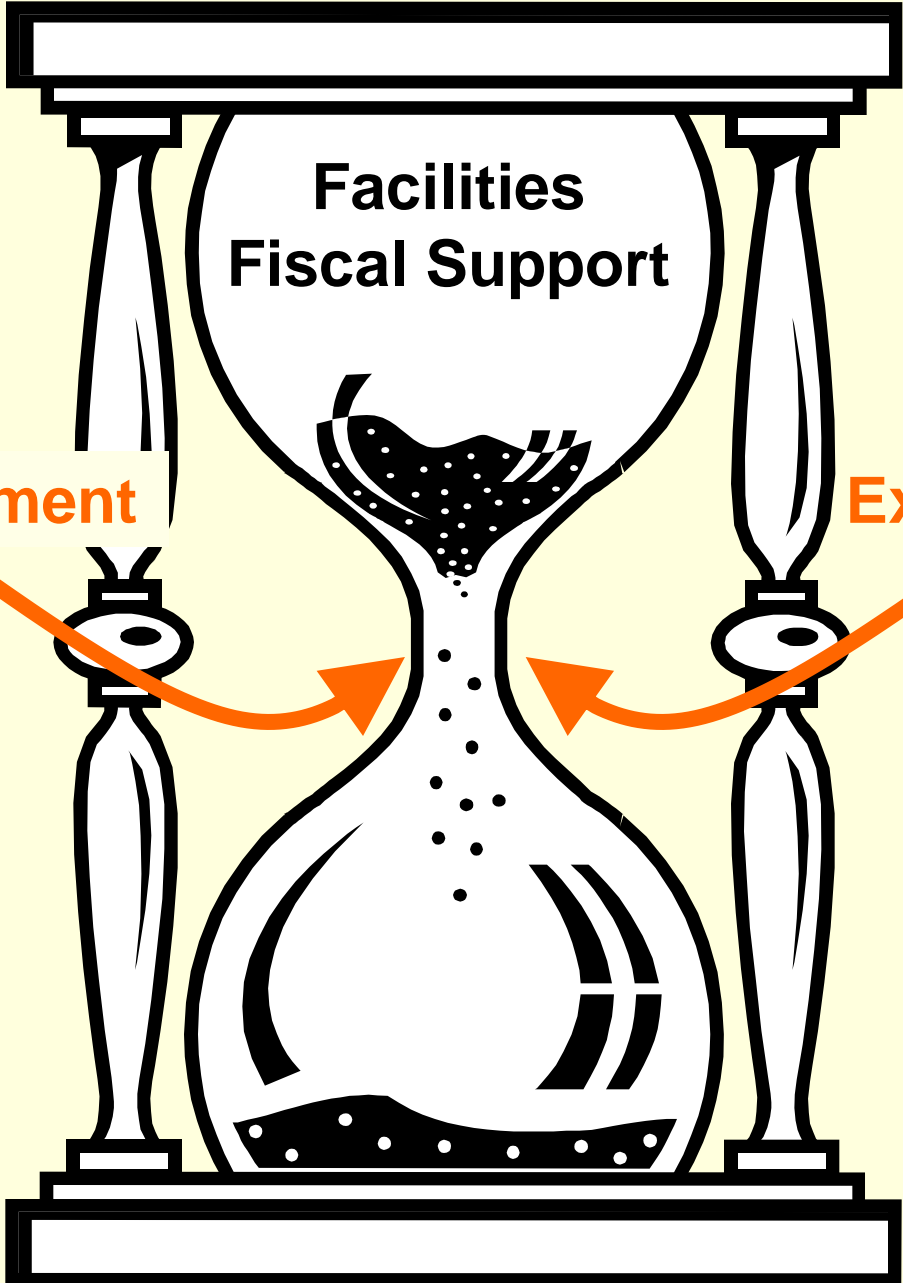
Environment

**Facilities
Fiscal Support**

External Gains



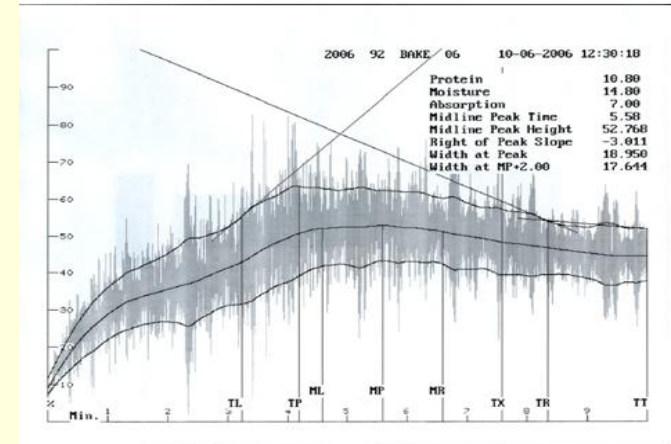
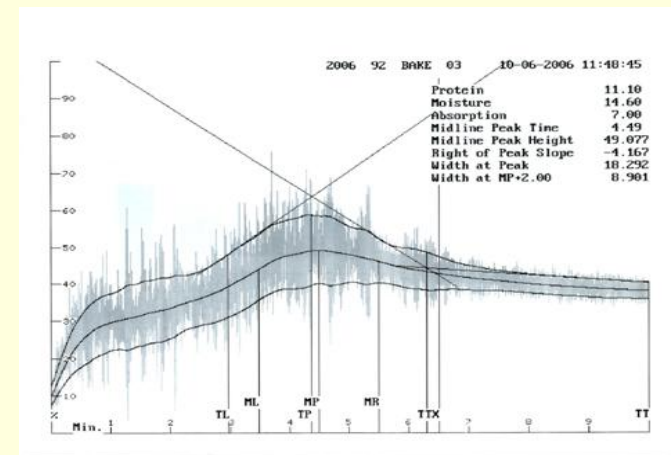
Varieties Out



End-product orientation

Quality is a devastating, competitive weapon.

-off the wall of a textile mill in North Carolina



Our Wheat Buyers



The Big Picture

Wheat today:

224 million hectares harvested

680 million tonnes produced

124 million tonnes traded globally

**Produce what we can sell, not sell
what we can produce**

*We're Oklahoma Risin', brighter
than a star*

*Stand up and sing about her, let
the world know who we are*

*We're the sons and the
daughters, children of the West*

*We're Oklahoma Risin', risin' up to
be the best*

Perspectives

- 60% productivity increase in 30 years?
- Need to put the offense in the field
- Transgenic applications: opportunity, but not salvation
- Molecular markers: tremendous voids, thus huge potential
- Phytochemical recovery – wide open
- Hard white wheat: buyers want choices