



LEVERAGING 'BIG DATA' FOR WHEAT IMPROVEMENT IN KANSAS AND AROUND THE WORLD

JESSE POLAND

Kansas State University

Feed the Future Innovation Lab for Applied Wheat Genomics

k-state.edu/wheat-innovation-lab

 @wheatlab



60%

Increase in demand for wheat by 2050

- 20%

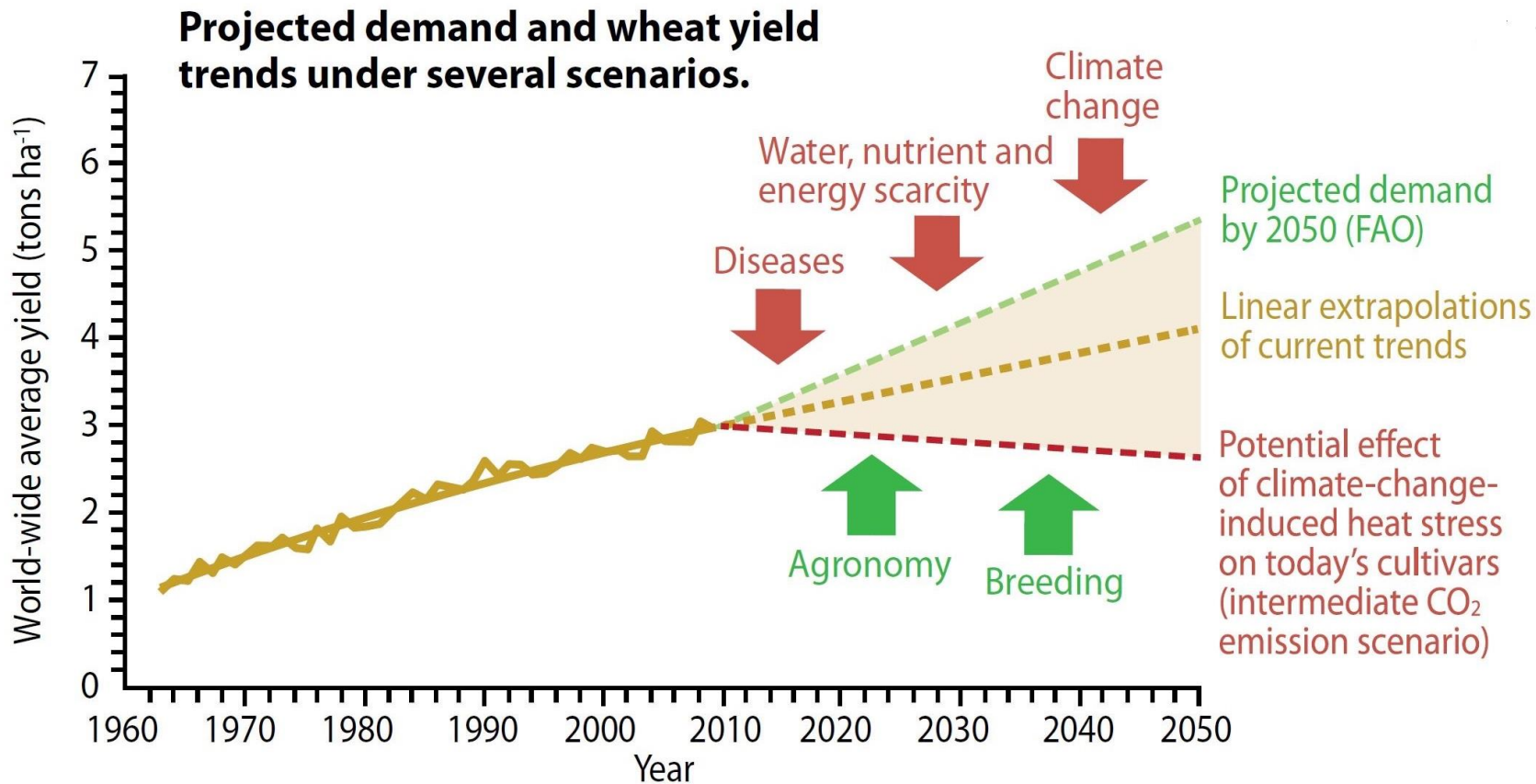
Potential average yield loss from climate change

>2%

Rate of gain needed to meet projections

~ 1%

Current rate of gain

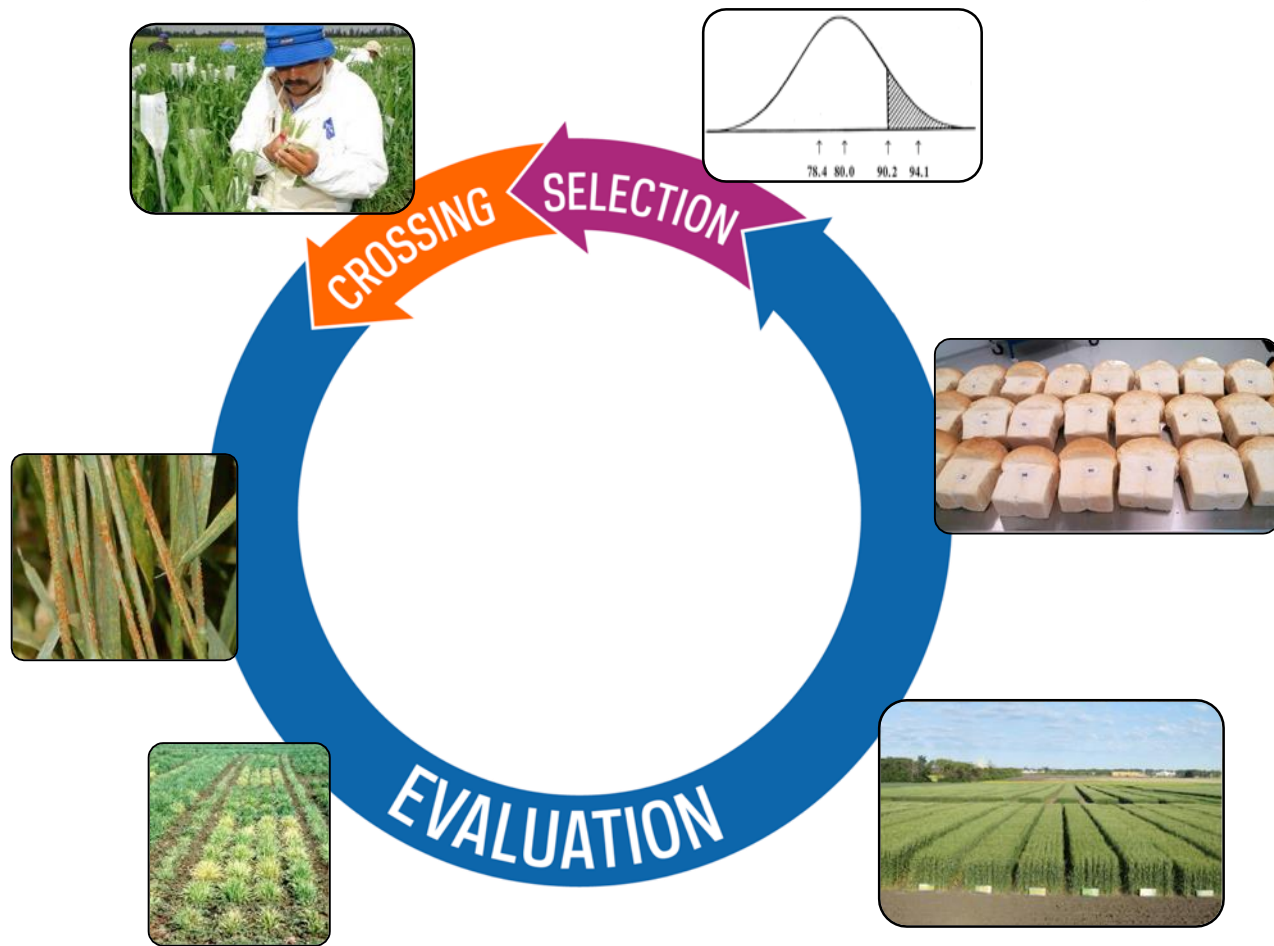




THE BREEDING CYCLE

genetic gain

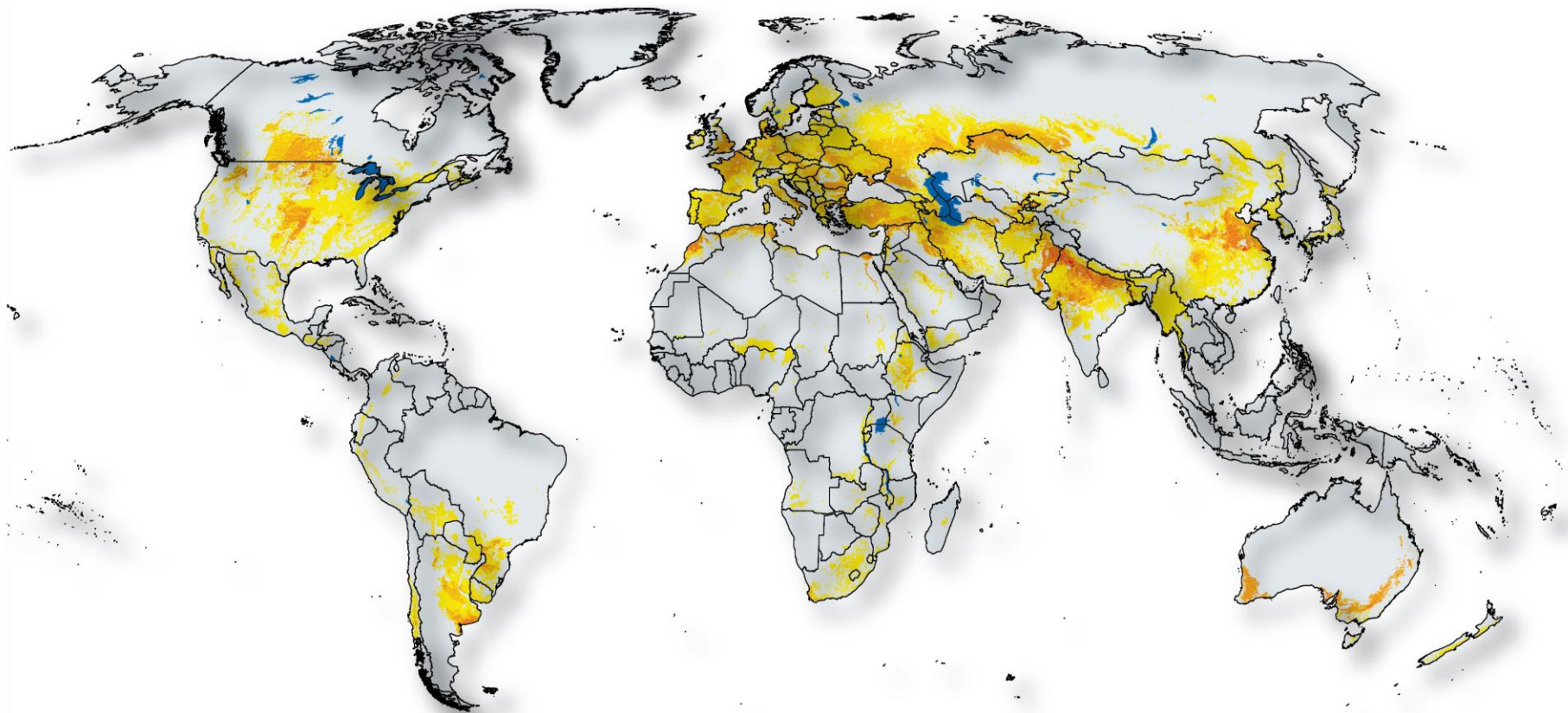
year on year progress in
overall performance of
breeding lines





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TARGET COUNTRIES

Focus is in South Asia, where over 20% over the world's wheat crop is produced. These extreme heat environments are highly vulnerable to the impacts of global climate change.

FAISALABAD

LADHOWAL

PAKISTAN

PUSA

JAMALPUR

JABALPUR

BANGLADESH

INDIA

International partners



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PREDICTION MODELS



- billions of data points
- wind speeds
- sea temperatures
- mathematical equations of physical process
- algorithms modeling the atmosphere at every point on the globe

super computer to simulate possible outcomes



PREDICTION MODELS

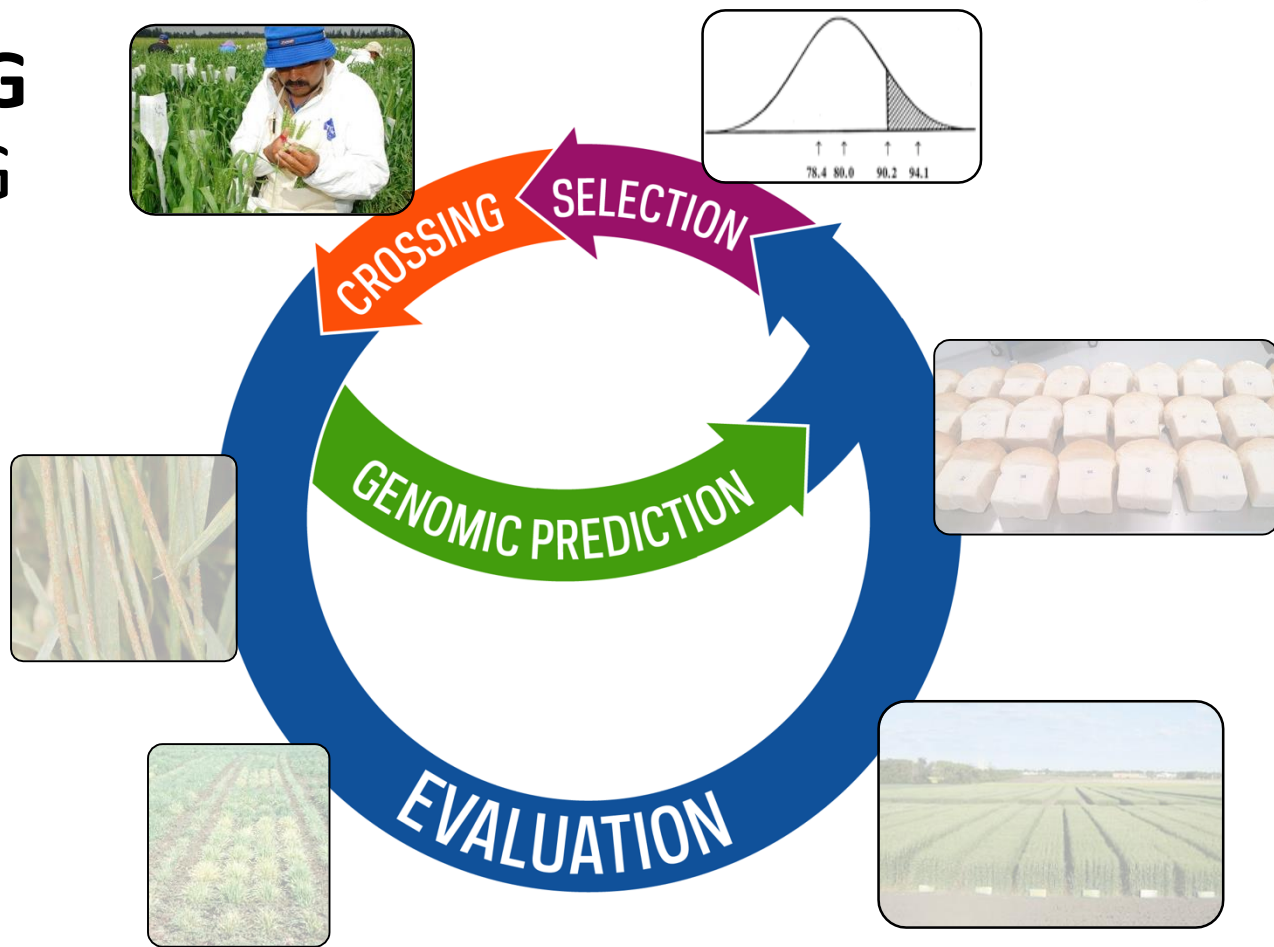
- billions of data points -
- yield and baking measurements -
- genomic information / sequence variants -
- mathematical equations of genetics -
- algorithms to calculate all of genetic effects -



processed on super computer to solve models



ACCELERATING THE BREEDING CYCLE





BIG DATA

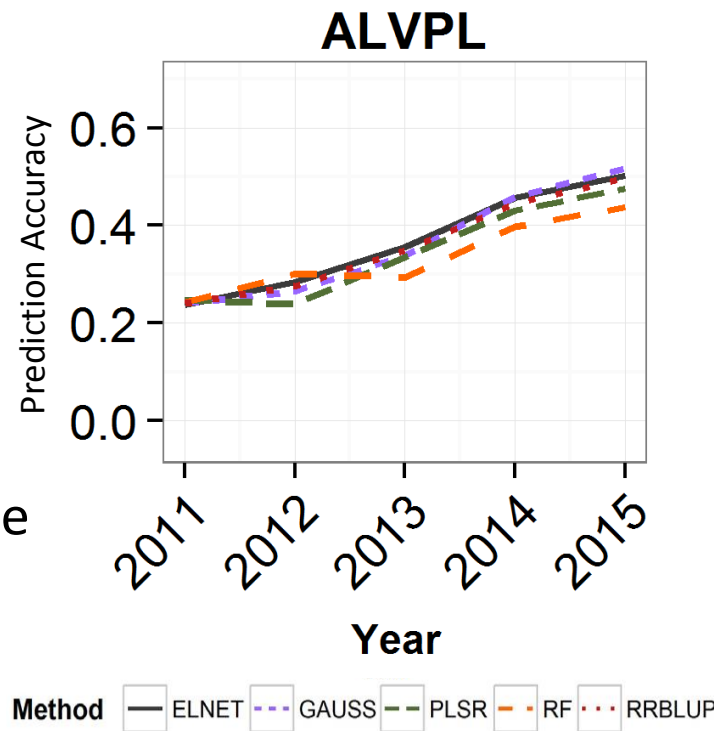
*data sets that are **so large** or **complex** that **traditional data processing application software** is **inadequate** to deal with them*

data driven modeling approaches
'the more data, the better'

The **GOOD**... we can predict about anything

The **BAD**... big challenges in modeling

The **UGLY**... big data is messy and hard to manage





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**KANSAS
WHEAT**

Rediscover Wheat

Photo: Kansas Wheat

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Cornell University

