

Technology lag: Is there a cost for failing to do it right?

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cultural lag

“refers to the notion that culture takes time to catch up with technological innovations, and that social problems and conflicts are caused by this lag”

Wikipedia

originated from Ogburn (1922)

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Is the beef industry keeping up with technological advance?

What does it mean if we are?

What does it mean if we aren't?

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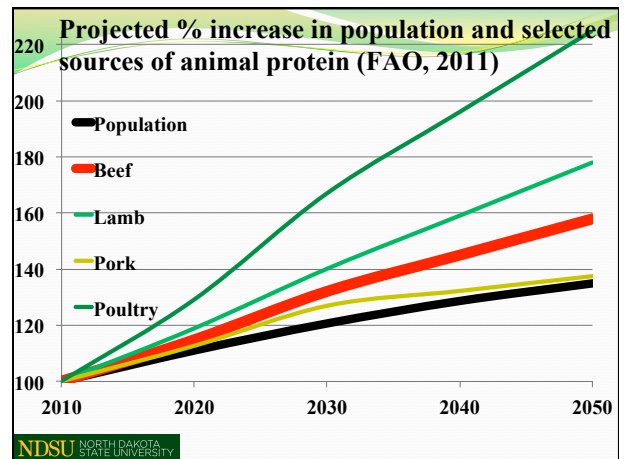
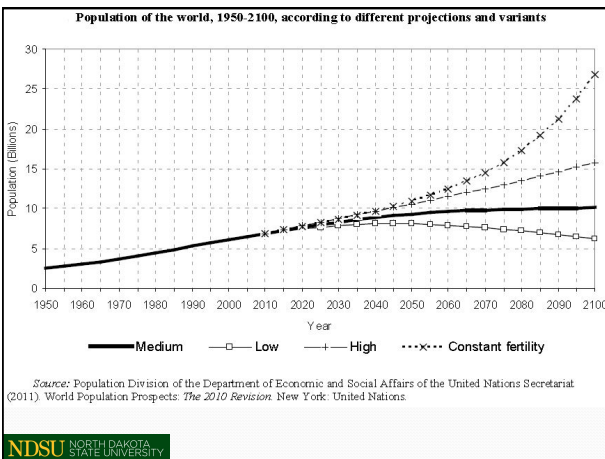
Why are we (the beef industry) here?

Produce beef

Provide safe, flavorful, nutritious source of protein and other nutrients

Contribute to feeding the world

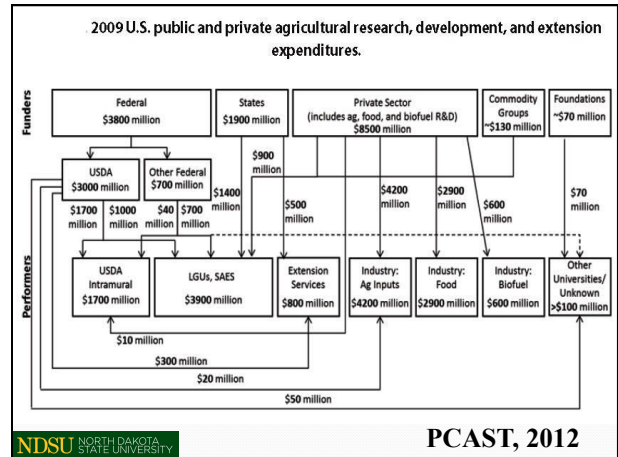
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What is needed to meet this demand?

Advances in technology

Willingness to use the new technology



PCAST, 2012

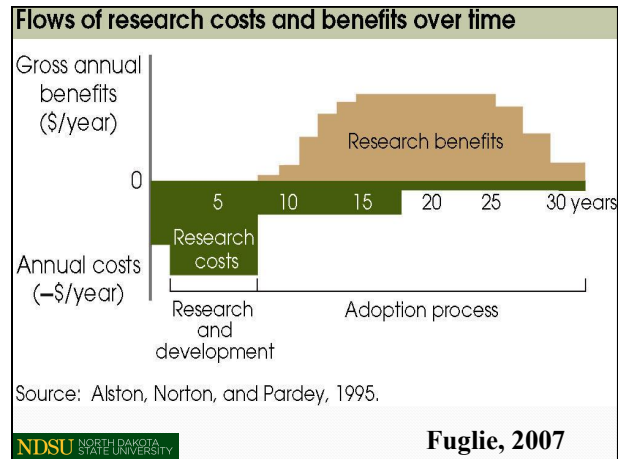
Time to adopt new technology

Development

Education

Acceptance

Adoption

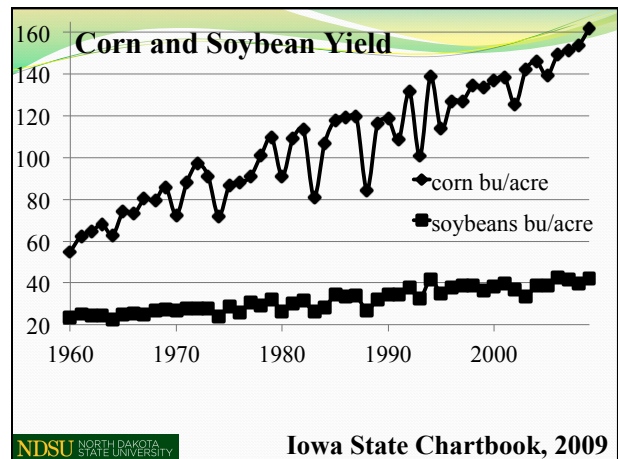


Fuglie, 2007

How has agriculture done?

Thomas Malthus (1798) – predicted that ability to provide for population would be overcome by the size of the population

Modern agriculture – has kept Malthus from being right (so far)



Iowa State Chartbook, 2009

Could these improvements be even greater?

Office of Technology Assessment

Congressional agency

Examined (1992) effect of increased technology use on productivity

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Productivity projections at differing levels of technology

	1990	Less new technology - 2000	Most likely technology - 2000	More new technology - 2000
Corn—bu/acre	116.2	113.8	128.5	141.6
Soybeans—bu/acre	32.4	32.6	33.7	36.4

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Office of Technology Assessment, 1992

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Corn—bu/acre	116.2	113.8	128.5	141.6
Soybeans—bu/acre	32.4	32.6	33.7	36.4
Beef lbs meat/lb feed	0.143	0.146	0.154	0.169
Calves/100 cows	90.0	93.75	96.22	102.45
Pork lbs meat/lb feed	0.154	0.174	0.181	0.196
Pigs/sow/year	13.9	14.0	15.7	17.8

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Office of Technology Assessment, 1992

Pork Industry

Target for Pigs/Sow/Year

1980s – 20 P/S/Y

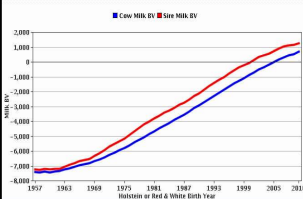
Late 1990s – 25 P/S/Y

Current – 30 P/S/Y

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National Hog Farmer, 2011

Change in average genetic merit in Holstein

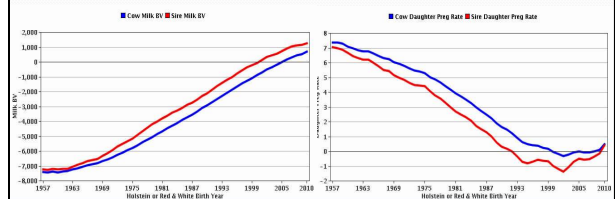


Milk Production

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Animal Improvement Programs Laboratory

Change in average genetic merit in Holstein

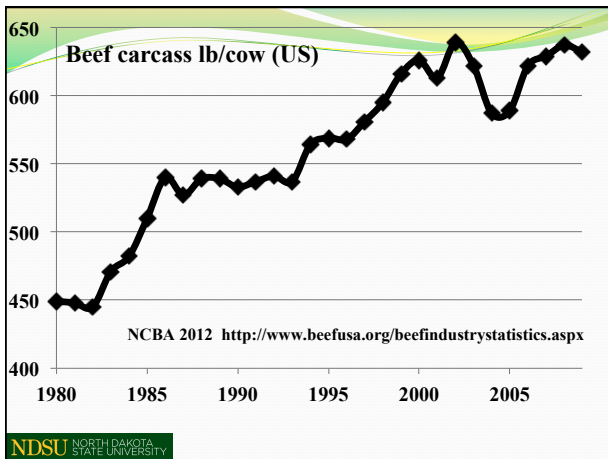


Milk Production

Daughter Pregnancy Rate

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Animal Improvement Programs Laboratory

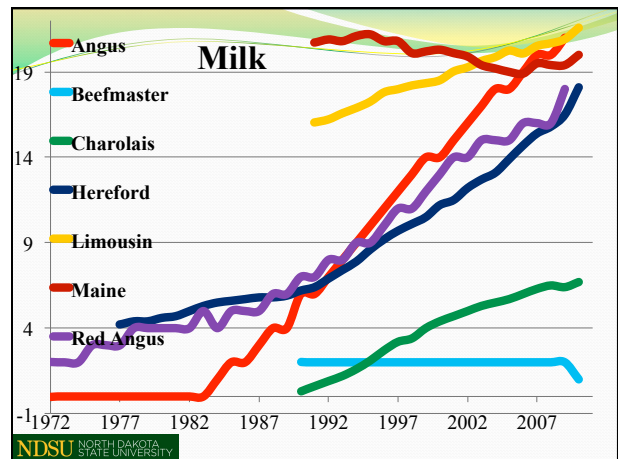
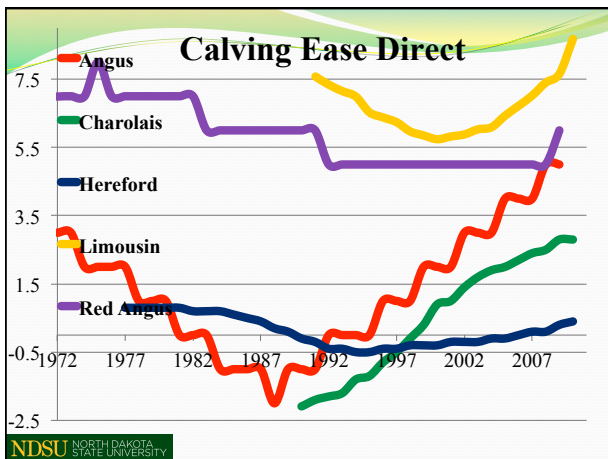
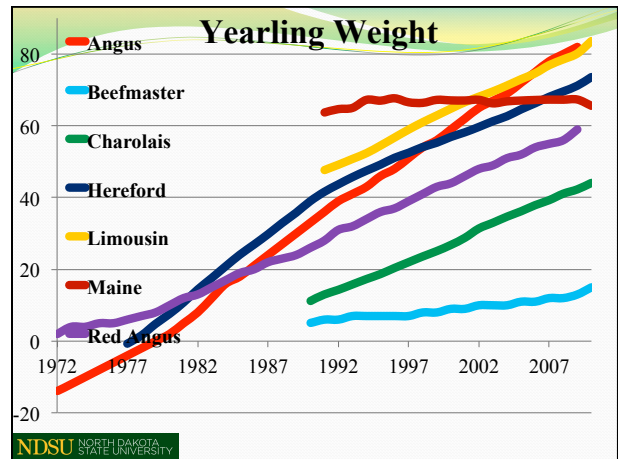
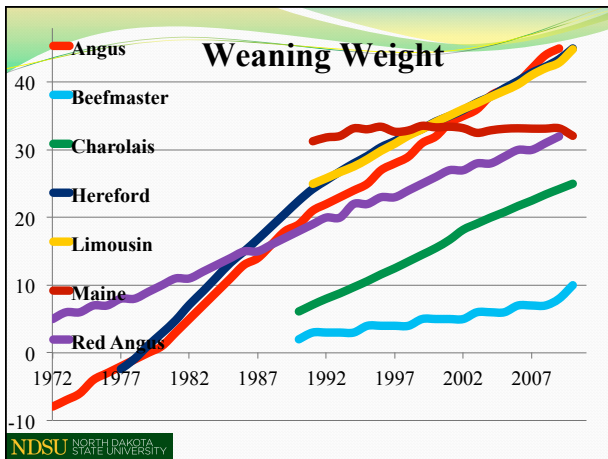


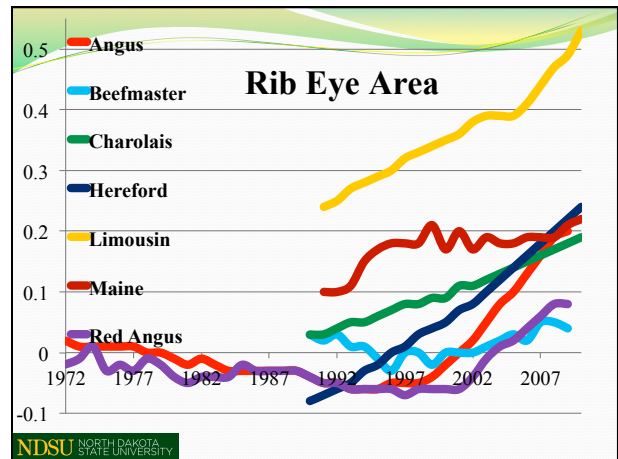
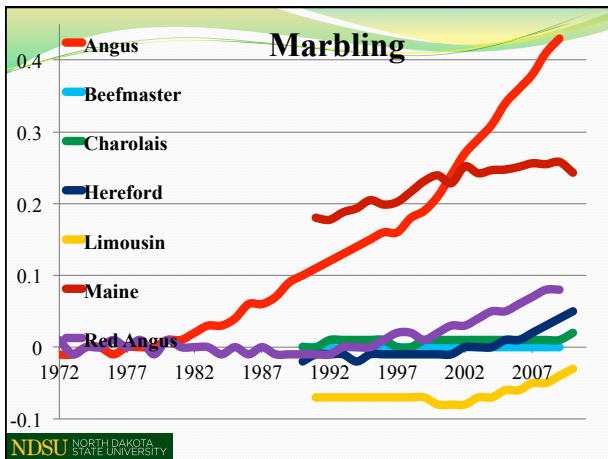
Where do we spend our selection resources?

$$R = h^2 S$$

S (selection differential) is a precious and limited commodity

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Not as disorganized as it looks

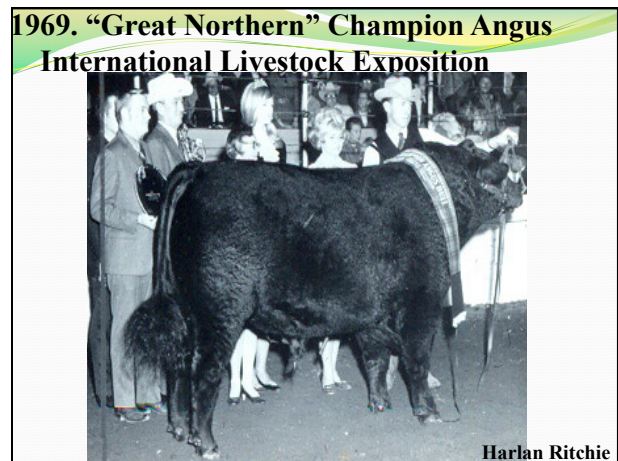
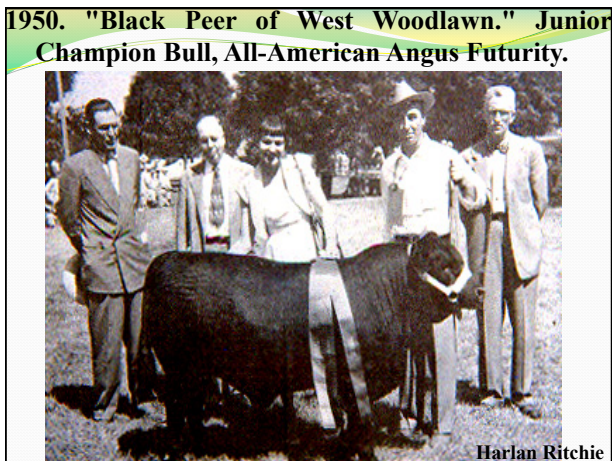
Not all breeds need to make the same genetic change

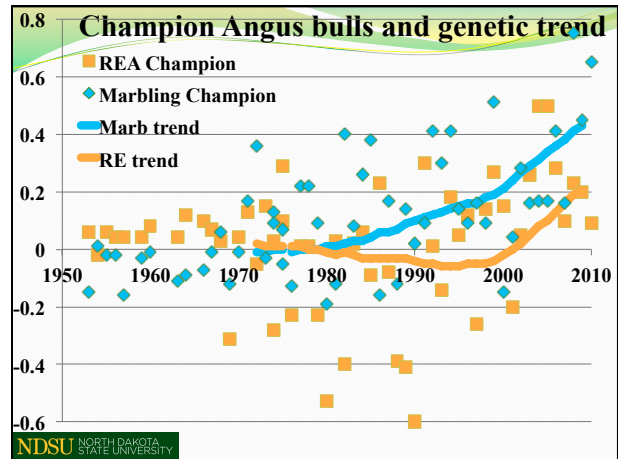
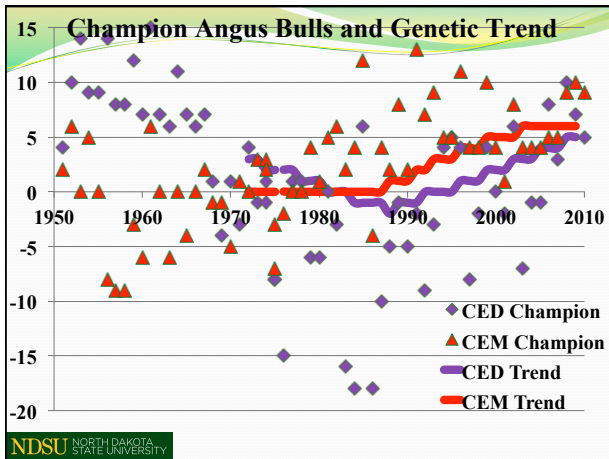
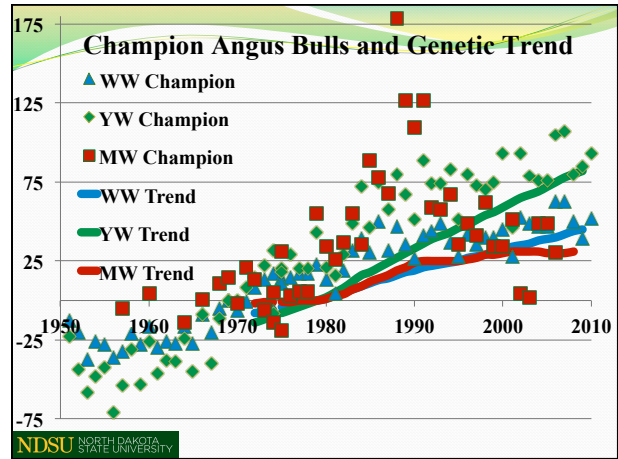
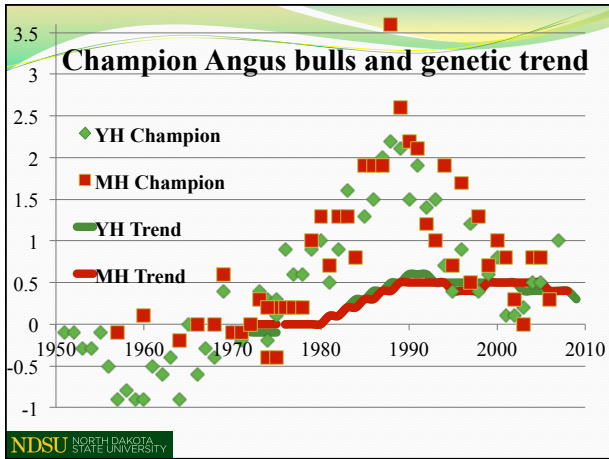
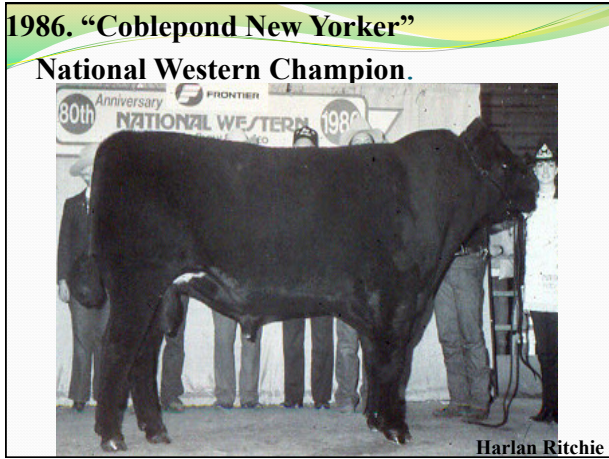
Cattle are raised in many different environments

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But the beef industry also exists in a parallel universe

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Are beef producers making full use of available technology?

Dickerson – 1995 Feed Intake Symposium

Questioner – “What are beef producers breeding for?”

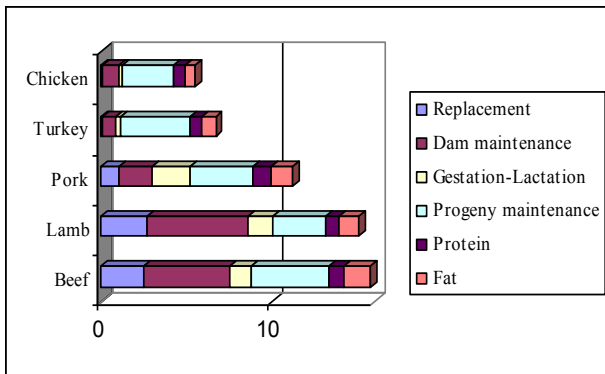
Dickerson – “For fun”

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Dickerson – 1995 Feed Intake Symposium

“Breeding objectives are more difficult in beef cattle than any other domestic animal by a large mark”

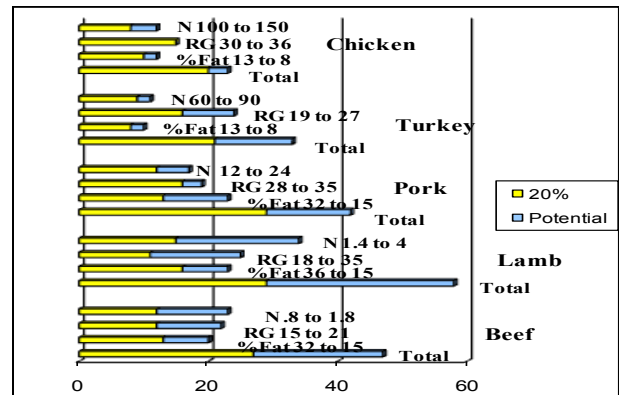
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Life cycle cost per kg of edible meat protein

Dickerson, 1978

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Potential genetic change in economic efficiency (Dickerson, 1978)

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Reasons for optimism

Broad array of EPDs

Growth

Carcass

Reproduction

Maternal

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Reasons for optimism

\$ Value EPDs

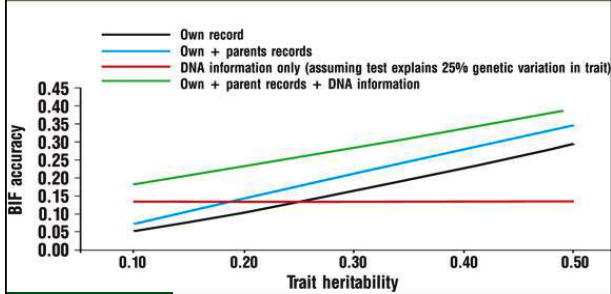
Beef industry finally embracing concept of selection index

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Reasons for optimism

Genomic enhanced EPDs

Figure 1. Effect of DNA information on Beef Improvement Federation (BIF) accuracy of EPDs given different sources of information and trait heritability



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Van Eenennaam 2011

A reminder (courtesy of Larry Benyshek)

“Better tools for genetic improvement will only get us into trouble faster if we aren’t selecting for the right things”

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Genetic modification

GMO crops

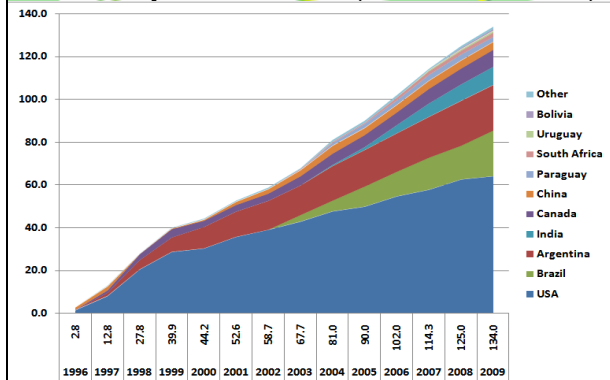
Recombinant bovine somatotropin

Transgenic salmon

In-vitro meat

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GMO crops – land area (million hectares)



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James, 2011 – ISAAA Briefs

March against Monsanto



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Recombinant bovine somatotropin

Increases milk yield

1993 - Approved for use

2007 – 17.2% cows (USDA)

Many milk processors pledge to not use milk from rbST treated cows

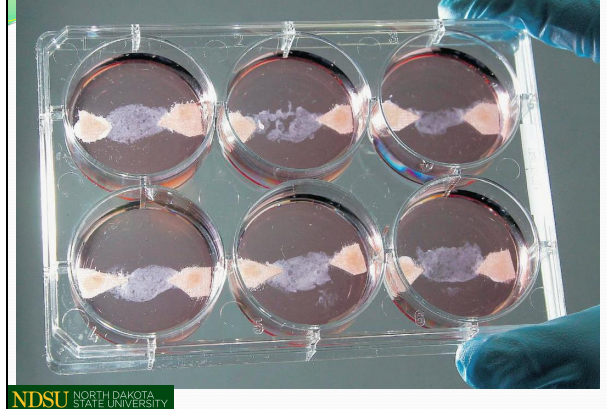
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AquaAdvantage Salmon (transgenic)

HOW THEY COMPARE



In-vitro meat (current price \$325,000/lb)



Is there a cost for failure to use technology?

Producer – earliest adopters gain the biggest advantage

Remainder are less competitive

Industry – less competitive

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Why fail to use technology?

Not enough pertinent research

Staying with tradition

Lack of incentive

Market signals that only exert pressure on some productivity goals

External negative pressure

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Is the beef industry “at a crossroads”?

Been “at a crossroads” all of my life.

**Good use of technology
could have been better**

Optimistic that it will be better

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