University of Minnesota

Partnering with Minnesota Agriculture

House Agriculture Finance Committee
February 23, 2017
University of Minnesota
Research, Education and Extension

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FY16 Agriculture State Special Appropriation $42.9M

Minnesota Agricultural Experiment Station (63%) $27M

Extension (37%) $15.9M
Agricultural State Special funded research, education and outreach have short term and long term impacts on:

- Agricultural productivity
- Innovation
- Food safety
- Air and water quality
- Biodiversity
- Animal & plant disease
- Educating the next generation
- Crisis response
- Climate Adaptation
- Health and Nutrition
Agricultural State Special Biennium Funding

<table>
<thead>
<tr>
<th>Biennium</th>
<th>Millions</th>
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<tbody>
<tr>
<td>2006-07</td>
<td>$101.3</td>
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<td>2008-09</td>
<td>$105.4</td>
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<tr>
<td>2010-11</td>
<td>$97.9</td>
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<tr>
<td>2012-13</td>
<td>$85.8</td>
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<tr>
<td>2014-15</td>
<td>$85.8</td>
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<tr>
<td>2016-17</td>
<td>$85.8</td>
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MAES Special Projects

The graph shows the budget allocation for various projects under the MAES Special Projects initiative. Each bar represents different projects with the following allocations:

- Rapid Agricultural Response: $500,000
- Small Grain Initiative: $1,000,000
- Water Quality: $1,500,000
- Avian Flu: $3,000,000

The total budget is $3,500,000.
CFANS Resources 2015-16

2014-2015 Resources: $139.8 Million

- Operations and Maintenance: $32.3 Million (23%)
- Tuition and Fees: $29.2 Million (21%)
- Sales and Other Revenue: $22.2 Million (16%)
- Gifts: $22.5 Million (16%)
- Indirect Cost Recovery: $6.4 Million (4%)
- Federal Allocation: $5.2 Million (4%)

$1.30 : $1
Research Revenue per Dollar of State Funding
What do MAES and CFANS Do With These Funds?

Foundational Science...
• Molecular Genetics and Gene Editing
• Computational Chemistry
• Informatics – Big Data – Computer Science
• Sensors and Robotics - Engineering
• Microbiology – Food Science
• Atmospheric, Climate, Water and Soil Chemistry and Physics

...Leads to Real Solutions
• Bio-control of invasive species
• Perennial crops improving soil health and Water Quality.
• Crops resistant to pests and drought.
• Animal Health and Efficiency.
• Hygienic bees that improve bee health
• Forest health and productivity
What’s the Return for Minnesota?

Competitive Economic Growth

▪ **10.6% Return on Research Investment**
  over 50 year period ending 2009 (Pardey, et al., 2010)

▪ **$40.6 in total returns in Minnesota for every $1 invested**
  > $21 to $1 average in other states. Attributed to Minnesota’s natural resource suitability and climate.
What’s the Return for Minnesota?

Reduced Impact on Natural Resources

Total Acres: 51 million

Current Situation w/ Agricultural Productivity Research

Farmed Acres
26.9 Mill.

Counter-Factual Reality Without Agricultural Research

Farmed Acres
57.5 Mill.

What's the Return for Minnesota?

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Current Situation w/ Agricultural Productivity Research

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Counter-Factual Reality Without Agricultural Research

Farmed Acres
57.5 Mill.
What’s the Return for Minnesota?
Reduced Livestock Footprint

Source: Capper, Cady and Bauman (2009); Capper (2011); Boyd & Cady (2012)
What’s the Return for Minnesota?
Livestock Productivity Growth

Milk Produced per Cow, MN
2016 = 20,975 lbs/cow

Pounds of Milk per Cow per Year

Pounds of Pork per Breeding Female


What’s the Return for Minnesota?

New Markets and Business

- Honeycrisp Apples
- Hygienic Bees
- Perennial Ryegrass Seed
- Forever Green – Intermediate Wheatgrass, Camelina, etc.
- Cold Hardy Grapes
What’s the Return for Minnesota?

Healthier Plants, Fisheries, Wildlife, Forests, Livestock, and People

▪ Disease resistant plants reduce pesticides
▪ Improved animal housing and biosecurity reduce antibiotics
▪ Food safety and security
▪ Human nutrition/dietetics – Obesity Center and Healthy Foods/Healthy Lives
▪ Aquatic and Terrestrial Invasive Species Centers
▪ Forest Resources Improving Forest Health and Productivity
▪ Bee and Pollinator Research
▪ Organic crop systems and dairy systems
What’s the Return for Minnesota?
Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC)

- Established 2014 by Legislature w/ ENRTF
- Approx. $13.61 million through 2023
- 124 terrestrial invasive plants, pathogens, and pests prioritized; 45 species targeted for future research.
- Focused on research in 2015, ~ $1.24 million funded.
- Oak Wilt, Stink Bug, Weed Range Expansion, Buckthorn
What’s the Return for Minnesota?

Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC)

- Soybean Growers partnership develops aphid-resistant soybeans and advance remote scouting of soybean aphids
- Soybean Growers and Minnesota Barley Growers are promoting MITPPC research its membership
What’s the Return for Minnesota?

Rapid Ag Response

- Reduce the severity of root rot in kidney beans
- Aid decision making and problem solving within farm family businesses during these times of change
- Eradicate Porcine Reproductive and Respiratory Syndrome from large swine systems
- Control and eradicate avian diseases associated with Minnesota's turkey industry
- Improve the viability of canola as an alternative crop for northwest Minnesota
- Develop effective approaches for managing aphid transmitted viruses in seed potatoes
- Eliminate scab infestation of wheat and barley

- Economic Impact Avian Influenza Alone: $600+ million
What’s the Return for Minnesota?
Regionally Customized Research

10 Research and Outreach Centers conduct research, share the results and train the next generation of ag and natural resources workers.
What’s the Return for Minnesota
Developed for Minnesota Impacts Global

• MN--43rd to 50th Parallels:
  - Center of Agro-Forestry Productive Band Globally
  - What Happens in Minnesota – Leads the World in Productivity
  - Eco-tones of Minnesota are a Living Laboratory
What’s the Return for Minnesota?
Affordable Food for Low Income Households (Reduced Pressure for Food Assistance)

- Low income households spend larger share of income on food
- Agricultural productivity R&D reduces food costs
- Low income households benefit more than higher income households

Data Source: Bureau of Labor Statistics, Consumer Expenditure Survey of Food
Yet...Decreasing Investments in Agricultural R&D

Source: 1970 to 2009 data from InSTePP (based on CRIS data); 2010 to 2014 obtained from MAES
Decreasing Investments in Agriculture Impact Productivity and Competitiveness

Share of Global Ag R&D Investment

Source: InStePP global public agricultural R&D data series.

Multi-factor Productivity: Index in base comparable output to total factor (inputs)

Productivity Gains Slowing

Source: FAOSTAT (2014).
So...Minnesota Invests!
Agricultural Research, Education, Extension and Technology Transfer (AGREETT)

“...Provide investments that will efficiently achieve long-term agricultural productivity increases through improved infrastructure, vision, and accountability. Grants shall provide for long term base funding that allows the research grantee to continue the research to its practical conclusion. Priority for grants shall be given to human infrastructure.”
The AGREETT Structure

- Administered by MN Dept. of Agriculture
- 21 member advisory panel to provide guidance.
- Contract to University of Minnesota
AGREETT Implementation

- **Positions Identified:**
  - 10 CFANS – 5 joint extension
  - 5 Extension Educators
  - 4 CVM – 1 joint CFANS, 2 joint Extension

- **First year – Infrastructure Investment**
  - Soils Testing, Oils Testing, Imaging tech AGP, Cloquet Forestry ($3.56 mill) CVM & CFANS: Animal Health and Food Safety ($550,000)

- **Technician Bridging $250k recurring**

- **RARF $600,000 recurring**

- **HPAI $1,000,000 recurring**

- **2020 Second round investment – as soon as first round underway – then begin identification process.**
| One Time Capital Investment | Soils  
Cloquet  
Imaging  
Food Safety |
|-----------------------------|---------------------------------|

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<tr>
<th>Faculty Round 1</th>
<th>Hires Begin Sept 1, 2018</th>
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<tr>
<th>FY 17</th>
<th>FY 18</th>
<th>FY 19</th>
<th>FY 20</th>
<th>FY 21</th>
<th>FY 22</th>
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<tr>
<th>Capital $4.3 m</th>
<th>Faculty R1 Salary (10 CFANS, 5 Ext. Ed., 4 CVM) $2m + Inflation</th>
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<th>Faculty R1 Startup $2.8</th>
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<th>Faculty R2 Salary (~7 Faculty, 3 Ext. ed., TBD) $0.85m+ Inflation</th>
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<tr>
<th>Faculty R2 Startup $1.4m</th>
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$4.8m/yr.

AGREETT Investment Timeline

Total Hires:
~ 25 Faculty
~ 10 Ext. Ed.

University of Minnesota
Driven to Discover™
What’s the Return for Minnesota?

Resident Education
U.S. Demand for Students in Agriculture

Education, Comm. & Gov.
7,200

Food & Biomaterials
8,500

Science & Engineering
15,500

Management & Business
26,700

Source: USDA, Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources, and the Environment, United States 2015-2020
What’s in it for Minnesota?

Undergraduate Talent Development for Business

- Agricultural Education
- Agricultural and Food Business Management
- Agricultural Industries and Marketing
- Animal Science
- Applied Economics
- Bio-products Marketing and Management
- Environmental Sciences, Policy and Management
- Fisheries and Wildlife
- Food Systems
- Forest Resources
- Nutrition
- Plant Science
- Pre-Bioproducts and Biosystems Engineering
- **Sustainable Systems Eng.**
What’s in it for Minnesota?

Undergraduate Student Pipeline

- 2,011 students in 13 areas of study
- 2016-17 Freshman class record (338)

**UNDERGRADUATE HOMETOWNS**

- Wisconsin: 18%
- Other U.S.: 14%
- Minnesota: 60%
- International: 8%
What’s in it for Minnesota?
NextGen Talent Growing Minnesota

- **15,000** alumni working across the state
- **83%** working in their field of study
- **60%** of the state’s ag educators
- **27%** enrolled in graduate programs
- **75%** have completed internships
What’s in it for Minnesota?

Scientists for Tomorrow’s Innovation –
Graduate Degrees

Degree requirements for plant scientists

- Bachelor’s: 26%
- Masters: 27%
- Doctoral: 46%

Identified Fields:
- Plant Breeding/Genetics (40%)
- Plant Sciences (20%)
- Plant Protection (24%)
- Regulatory Science (9%)
- Other (7%)

Source: Coalition on Sustainable Agricultural Workforce
What’s in it for Minnesota?
Graduate Programs and Research

Graduate Education programs

- Animal Science
- **Applied Economics***
- Applied Plant Sciences
- Bioproducts and Biosystems Science, Engineering and Management
- **Conservation Biology***
- Entomology
- Food Science
- Land and Atmospheric Science
- **Natural Resource Science and Management***
- Nutrition
- Plant Biological Sciences
- Plant Pathology
- **Water Resources Science***

*Interdisciplinary Graduate Degree Programs
Investing In Minnesota’s Future

CFANS’ Vision

- **EDUCATION:** *Challenge 500*

- **RESEARCH:**
  - “*Sustaining Growth in Agricultural Productivity*”
  - “*Science of Sustainability of Natural Resources*”

- **LIVING LABORATORIES:**
  - 21st *Century Reinvestment in AFNR Research Facilities*
Challenge 500

Reach CFANS’ capacity of 500 NHS admitted by 2020

- Challenge UM and partners to help us achieve goal focused on rural Minnesota students

- Recruitment and advising strategy
  - “Admission-to-Success”
  - Extension 4-H STEM, CFANS MNYI, Alumni Ambassadors

- Scholarship and internship strategy – Land Grant Legacy Scholars

- We need the support of our rural advocates

- Includes President’s Emerging Scholars strategy
  - First generation college and under-represented students

- Changing the narrative on U of M v. Others
Research Strategic Investment: Sustaining Growth in Agricultural Productivity

Science of Sustainability
Integrated Research Platforms

Crop and Livestock Genetics for Productivity and Improved Traits

Microbial Science Research for Soil, Plant, Human and Animal Nutrition and Productivity

Advancing Soil Fertility and Water Quality and Availability Through Managed Crops and Forestry

Decision Agriculture: Aligning measurement technologies, Information Technologies and Economics for Improved Management

Nutrient Recycling and Management for Improved Utilization and Resource Efficiency

Agro-Ecological Innovation in Managed Crops to Improve Biodiversity

Technology Stewardship of Pest and Disease Resistance and Adaption to Climate Change

Growing Agricultural Productivity Sustainably
New Partnership Platforms
University - Government - Industry

Big Change:
- Industry Driven Sustainability and Productivity
- Intersection Public/Private Good
- Landscape Level Challenges
- Examples:
  - Forever Green
  - IAA
  - IASB

Foundational Bio-Science
Field Experimentation
Grad Mentoring
Policy and Economic Analysis and Recommendation
Public Education Programming

Field Implementation
Policy/Regulatory Implementation
Funding and appropriations
Public Education
Tax and revenue incentives

Development in Market
Marketing/Branding
Demand Pull for Products
Funding/Investment
Scale into Market
Market testing/branding
Manufacturing scale

Research
University
Facilitation
Government
Implement
Industry
Key Research Platforms

▪ Forever Green
  - Multiple Universities, NGO’s, Businesses and Government
  - Perennial and Annual Cover Crops w/ Market Value

▪ Integrated Animal Systems Biology
  - Animal Productivity w/ Resource Efficiency
  - International, Industry, Government

▪ Agro-Informatics Alliance Platform – Big Data

▪ Stakman-Borlaug Center – Oat Global

▪ Aquatic and Terrestrial Invasive Species
The Land Grant University
Our Living Laboratory
New Bee Research Lab Opened Fall 2016
Bell Museum + Planetarium – Summer 2018
New Dairy Research Facility (TBD)
Convener and Central Gathering Place for Education, Research, and Outreach

- **Research**
  - Laboratories – Growth Facilities, Pilot Labs
  - Fields – SPC – Micro-intensity
  - Co-location – Private/Public Firms on Site Incubators
  - Bio-Design – Cellulosic Products and Bio-Energy

- **Teaching**
  - Group Learning, Technology Enhanced Classrooms
  - Hands on Technology/Biology
  - Distance Education with Global Experience
Convener and Central Gathering Place for Education, Research, and Outreach

- **Living and Learning Lab Hands-on Learning**
- **Three Mile Walk**
  - Bell Museum, Fields, Raptor Center, Display Gardens, Bee Lab/Pollinators, Mullins’ Forestry, Plant Growth, Livestock, Vet Medicine, Food Science and Nutrition
- **Café and Other Features**
  - Featuring U of MN developed food
  - Leverage recent Greek investment in student learning communities
Research, Education, and Extension

Advancing Minnesota as a Leader

- Educating the Workforce
- Sustaining Growth in Agricultural Productivity
- Discovering New Science
- Protecting Natural Resources
- Building Healthy Communities

In partnership with Minnesota Agriculture