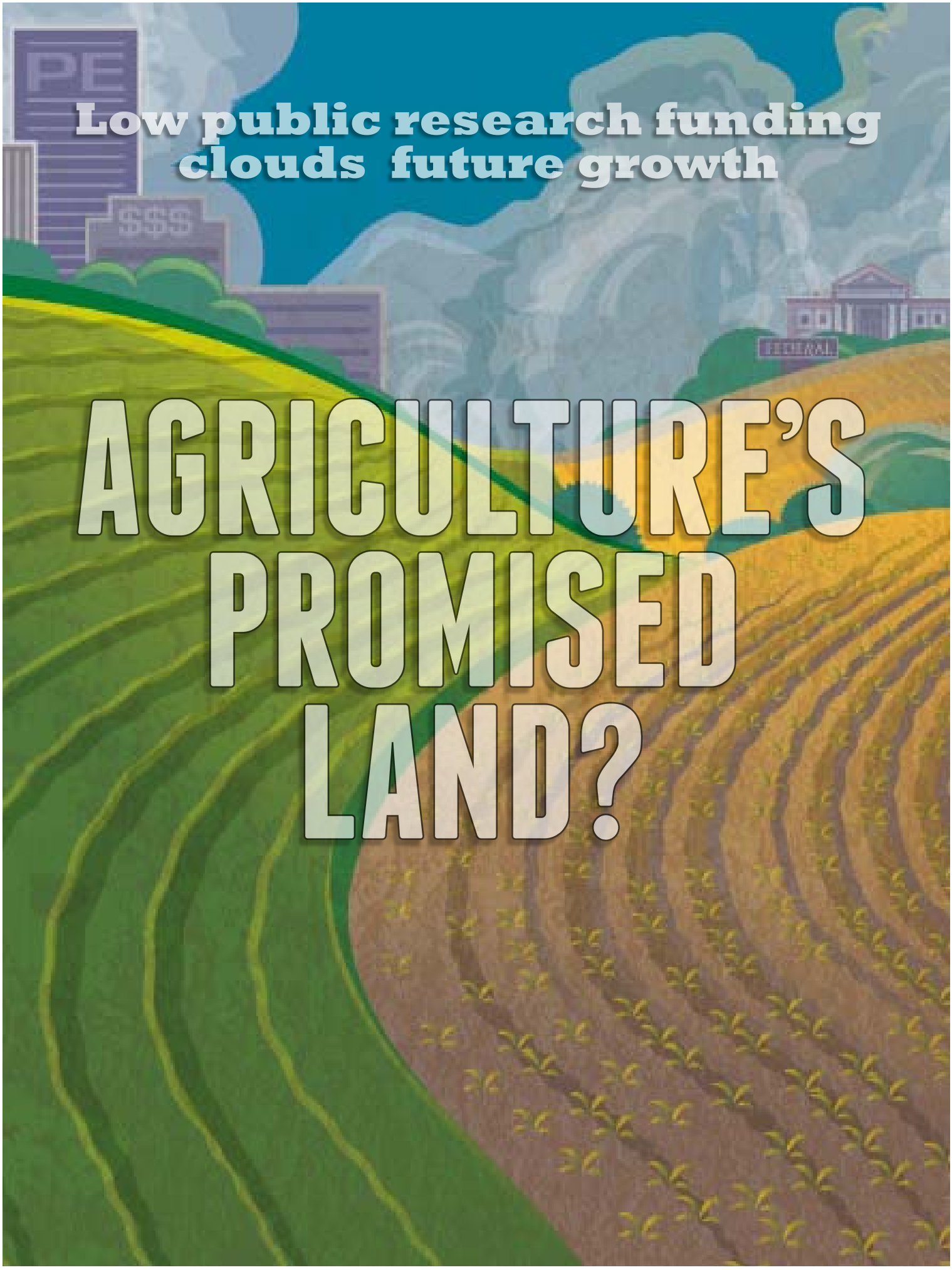
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Low public research funding clouds future growth
AGRICULTURE'S PROMISED LAND?

By Cheryl Tevis, Farm Issues Editor • Illustration by Paul Lange

Selling a farm doesn't often stir public controversy beyond the local coffee shop. But what if the farm is part of your land-grant university? Recently, 10,000 people joined a grassroots campaign protesting a University of Nevada-Reno Board of Regents request to rezone a 104-acre urban campus farm for commercial development.

"I can't imagine a more important mission for a university than educating new farmers in food safety, food security, and a strong economic future," says Wendy Bartoli, a Reno farmer who led the fight. "Somewhere that mission has been lost."

Bartoli's concern is real. Land-grant universities were established in 1862 to bring higher education in agriculture, science, and technology to a wide swath of Americans. The mission expanded in 1887 with federally funded research arms known as experiment stations.

Wallace Huffman

This federal- and state-funded commitment to public agricultural research was a revolutionary model that made U.S. agriculture the envy of the world.

"Ag research has contributed to U.S. productivity and economic growth," says Wallace Huffman, Iowa State University economist. "The future productivity of the global food and agricultural system will be determined by today's investments in research and development."

But as land grants celebrate their sesquicentennial in 2012, they confront unprecedented challenges that threaten to undermine the foundation of this historic commitment. Supporters fear that steep budget cuts, combined with a waning social contract and national sense of purpose, may leave urgent research priorities to wither on the vine.

States have been reducing support for at least two decades. Recent cuts include:

- Penn State University cut 19% to its College of Ag Sciences in 2011 ($10.5 million in research/extension).
- University of Georgia sold two research farms to cope with a 25% cut in 2011.
- University of Nevada-Reno closed its Ag College in 2011, folding portions of it into other departments.
- University of Vermont sold its 155-head dairy herd in 2010.

These shortfalls triggered by the economic downturn top off three decades of shrinking federal support. The average annual growth rate for public ag research expenditures, adjusted for inflation, shows an eroding base:

3.2% - 1960 to 1979
0.9% - 1980 to 1989
-0.8% - 1990 to 2009

The National Institute for Food and Agriculture, which funnels much of this federal support, took a 9% cut in fiscal year 2011. For fiscal year 2012, water quality research was cut in half and food safety was zeroed out.

"New advances in science and technology build on earlier research," says Huffman, who chaired the 2011 Council for Agricultural Science and Technology (CAST) report, "Investing in a Better Future through Public Agricultural Research."

"The R&D [research and development] needed to develop new technologies for farmers frequently has a long gestation. The results of a lack of investment aren't apparent for years, but eventually the well runs dry. Long periods of low basic R&D can't be quickly reversed," he says.

Although public funding has declined, private-sector investments have spiked (see chart below). A new USDA Economic Research Service report, "Research Investments and Market Structure in the Food Processing, Agricultural Input, and Biofuel Industries Worldwide," states that from 1994 to 2007 annual private-sector R&D for food and agriculture grew 4.3% per year. Crop inputs led this increase, spurred by seed and biotechnology.

But rising public research doesn't compensate for dwindling public investment. Public research focuses on basic (or fundamental) science and scientific training. According to USDA's 2000 Inventory of Ag Research, about 60% of total public R&D was allocated to plant/animal systems; 15% to food/human nutrition; 18% to environmental issues; 7% indirectly related to food/farm production.

This research has high social value, but low profit incentives. "Although the private sector is doing more of its own, it relies on building public research into its R&D," Huffman says. "In some applied areas, the private sector doesn't find it profitable to do significant research. Much of the improvements in U.S. small grains has been left to the public sector."

SLOWING PRODUCTIVITY

As the public funding infrastructure has eroded, research expenditures focused on increasing ag productivity at flagship land-grant universities have begun to slide. See table on page 40.

Trends in Public and Private Food and Agricultural Research Spending in the U.S. Billions constant 2006 U.S. $

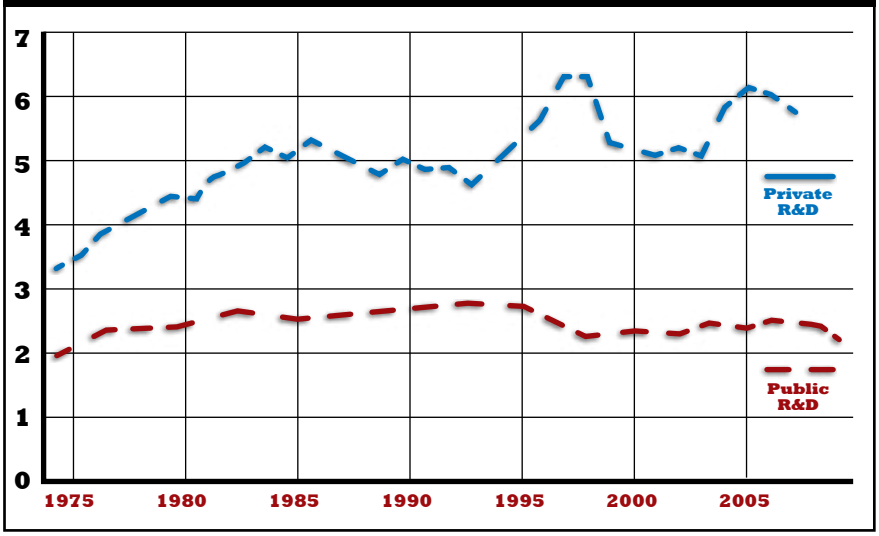

Chart Sources: Private agricultural data from USDA and the ERS; Public agricultural data from Huffman, Iowa State University. Photography: Bob Elbert, Iowa State University.

Banking on Public Research

Mike Arnoldy, Kennebec, South Dakota, knows he's hit pay dirt. His adoption of no-till methods 20 years ago resulted in reduced erosion, better soil health, improved yields, and reduced labor. Arnoldy credits his decision to research at Dakota Lakes Research Farm near Pierre and to manager Dwayne Beck.

"For a study on a six-year rotation, you need four cycles to get good data. That's 24 years," Arnoldy says. "We're just getting to where we're getting some good data."

The research farm also focuses on diverse rotations, cover crops, and reducing reliance on fossil inputs.

Dakota Lakes Research Farm was established in 1990 with joint funding from the state and a private, nonprofit corporation of area farmers. The 840-acre farm is a unique model. South Dakota State University pays for a small staff (including Beck) and farm utilities. The farm hosts test plot studies conducted by SDSU scientists.

Arnoldy serves on the 11-member board. The corporation owns the land and manages production, fixed facilities, and much of the equipment. Profits on the production enterprise go to a production account and are used for research priorities. The South Dakota commodity councils and the Wheat Commission also have partnered on research for 20 years.

"If farmers want more control of research, they may have to pay," Beck says "It's one way to focus on local research." •

"There are real consequences to letting it decline," Huffman says. "U.S. agricultural productivity growth has slowed the past decade. From 2000 to 2006, China and Brazil had double the average ag productivity growth rate of the U.S.. They're investing in public ag research and developing new technologies."

Future productivity also hinges on a robust natural resource base. "It's not the time to cut investment in ag production from the standpoint of food security," agrees Lois Wright Morton, Iowa State University project director of the USDA Climate & Cornbased Cropping System. "But lost productivity isn't the only impact of budget cuts. There have been significant cuts in natural resource conservation systems. If we gut our environment to solve food security problems, we're taking away our future capacity to produce. These two priorities are intimately connected."

Lois Wright Morton

But farmers aren't the only ones with a stake in the public agricultural research funding fight.

"It's good for society as a whole if resources are managed sustainably," says Dwayne Beck, Dakota Lakes Research Farm manager, Pierre, South Dakota. "Farmers manage ecosystems, and ecosystems impact everyone."

The benefits of farm productivity have translated into more abundant food at lower prices for U.S. consumers. From 1948 to 1996, the real price of food at home declined at an average rate of 1% per year.

Economic benefits also are significant. Investment in public ag research supports 3.7 million jobs and sales of ag goods, services, and food in the U.S. and globally.

WHO SETS AGENDA?

Ag researchers say declines in public funding have been exacerbated by a shift in the 1990s from long-term, federal block grants to competitive grants. "We need both," Huffman says. "One result of the shift toward competitive grants is that funds are awarded to private and non-land grant public researchers. Land grants only receive about 40%."

The shift also means research priorities increasingly are set at the federal level, creating a one-size-fits-all approach. Beck argues that state researchers are able to tailor projects to local needs, soils, climates, and emerging problems. He points to a two-decade systems research focus at Dakota Lakes Research Farm. The result has been a successful no-till adoption in a large part of South Dakota.

"The first stage was small plots," he says. "Small plot results may not make ➢

Saving Soil and Water Resources

At Dakota Lakes Research Farm near Pierre, South Dakota, a goal of maximizing water efficiency in the 1980s led to an intense focus on conservation tillage and crop rotations.

"It comes down to ecosystem management," says Dwayne Beck, farm manager. "From 1975 until 1990, the area grew winter wheat/summer fallow or irrigated corn. Wheat prices were high; fuel costs were low. After the oil embargo hit, we had high fuel costs, low commodity prices, and high interest rates. We couldn't afford irrigation unless we found a way to get water to enter the soil, not run off to the river or leach into groundwater. We needed surface cover to stop evaporation. No-till was the tool."

Beck estimates the research farm contributed to a $1.4 billion increase in crop value each year in a region between the Missouri and Jim Rivers from 1990-2010.

"We have a mind-set in the U.S. that we're not going to make money if we manage sustainably," he says. "It hasn't been true in central South Dakota. The right thing to do has been the most profitable thing."

A new initiative is aimed at restoring livestock to the region."If we have more livestock here, the nutrients stay here," he says. •

Photography: Top, South Dakota State University. Middle, Iowa State University. Bottom, Greg Latza.

Fueling Future Energy Needs

The convergence of agriculture and energy calls for continued research into biomass crops.

One large driver of research and development (R&D) is the expectation of higher demand for alternative energy sources, spurred by rising costs of fossil fuels and public concern about national energy security and greenhouse gas emissions.

Public-sector investments in biofuel R&D are considerably less than private-sector investments, according to a December 2011 Economic Research Service report, "Research Investments and Market Structure in the Food Processing, Agricultural input and BioFuel Industries Worldwide."

"While government subsidies and regulations helped stimulate demand for biofuel, public-sector investments in biofuel R&D now appear to be considerably less than the private-sector," the report says.

U.S. government subsidies for private biofuel R&D totaled $24.4 million in 2009.

The harvest, transport, and storage of cellulosic material are logistical needs that require key research for future success.

The board of directors at Dakota Lakes Research Farm near Pierre, South Dakota, has a goal to be geologic carbon neutral by 2026. "We want to do without fossil fuel," farm manager Dwayne Beck says. "But using too much biomass cuts organic matter in soil. We have half the organic matter we had 100 years ago." •

sense in the real world, so the next step-up was on-farm research. Then we increased the scale to fieldsize production to see if it made money for real farmers."

Hybrid corn development and reduced tillage systems required decades of research. But federal funders increasingly favor projects with a high probability of success, as well as a quicker turnaround.

"We have to look over the horizon 100 to 600 years for what's sustainable," Beck says. "If you fund short-term interests, you get short-term projects. There's a tendency to design projects to get desired results if you want to be funded again."

Competing for grants is time-intensive and is shifted into a more political arena.

HIGH-STAKES RESEARCH

Global challenges are rising as public investment sinks. A targeted infusion of funds could prime the pump for:

1 Adapting to climate change and the impact of increased weather variability on crops, crop diseases, and livestock.

2 Finding new and sustainable energy sources and reducing fossil fuels. The farm/food system is energy-intensive.

3 Gaining global food security for a growing population. New CAST projections suggest the long-term downward trend in real-world food prices is over.

4 Ensuring natural resources and environment. Water and soil are the core of agriculture and food production. Living standards around the globe hinge on availability and efficient use of resources.

5 Maintaining U.S. world ag competitiveness. Studies in 2010 by Alston and Huffman suggest slowed productivity growth for the next two decades.

Public, private, and government partnerships are vital. Reliance on the private sector creates a disproportionate focus on markets with strong intellectual property rights, as well as less public access to new crop varieties and technologies.

Increased funding of basic and applied research will require cross-sector efforts to identify research targets and partnerships, as well as new funding mechanisms. Morton says transdisciplinary collaborations will become more common. (See sidebar above, right.)

Finally, raising public awareness of agriculture and food as the seedbed for a stable economy and society will require renegotiating the 150-year-old social contract and planting seeds for new coalitions.

"Climate change, water quality, and food security aren't just farm issues," Morton says. "We need to connect to a larger community and make our research needs more visible."

The 2011 CAST report underscores the economic argument that investment in public ag research generates a 50% real rate of return. Few other public-sector investments compare. "It's legitimate to ask who benefits and who pays," Beck says.

He points to the need for a long-range national commitment to research. "We need a shared vision like the 1960s race to the moon," he says. "It's not good enough to make the rocket go a little higher."

He adds, "Before you make policy, you need informed, unbiased, open, transparent research. The most costly research just might be the research we don't do." •

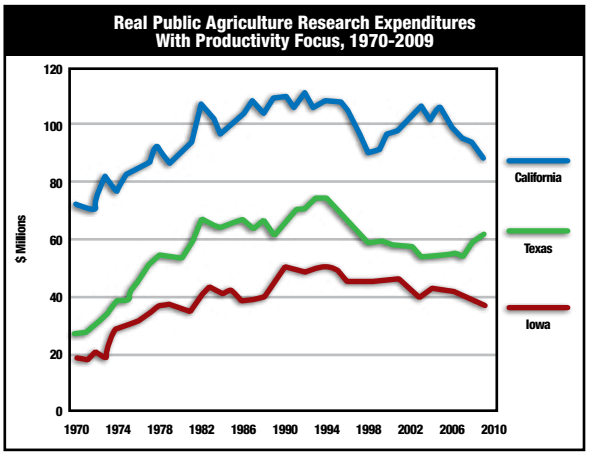

Chart Source: Iowa State University

Lay Groundwork For Climate Shift

Being a team captain was good preparation for Lois Wright Morton. Today the Iowa State University sociologist is coordinating a team of 50 scientists from 10 land-grant universities and one USDA Ag Research Service institution in research aimed at keeping crops resilient in the face of future climate uncertainties.

The USDA National Institute of Food and Agriculture has awarded $20 million to the Climate & Cornbased Cropping System (CAP) Project over five years.

"It's an example of a transdisciplinary team addressing complex and difficult problems facing agriculture," Morton says.

Researchers began collecting data on carbon, nitrogen, and water movement last summer from 26 research sites in eight states. They use special equipment to monitor greenhouse gas emissions. The team will integrate field, climate, social, and economic data to create models and to evaluate crop-management practices.

The regional project directly involves 200 farmers and local watershed groups.

"It's challenging to work with a diverse team of researchers from multiple disciplines who are sharing data to produce collaborative work," Morton says.

This type of research isn't cheap. "When you divide the $20 million among researchers, it's not a huge amount of funding," she says. "But it's expensive not to do. Agriculture can't afford to not find solutions to future climate impacts." •