New report identifies how to supercharge agriculture science in the US

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A new report issued today showed how U.S. farmers—facing a surge of weather events and disease outbreaks—can increase production and revenues with innovations produced by federally funded agricultural research.

The U.S. needs to increase its investment in agricultural research or it

risks falling further behind China, according to a new report issued by the Supporters of Agricultural Research (SoAR) Foundation and 20 FedByScience research institutions.

The new report, Retaking the Field: Science Breakthroughs for Thriving Farms and a Healthier Nation, highlights research projects in the five Science Breakthroughs areas identified as the most important fields to advance in agriculture by the year 2030: genomics, microbiomes, sensors, data and informatics, and transdisciplinary research. These areas were determined by the National Academies of Sciences, Engineering, and Medicine (NASEM) as part of a widespread scientific effort to prioritize agricultural research endeavors.

"Investments in these five science breakthroughs will allow us to achieve a number of broader goals for food and agriculture in the U.S. in the next decade," said Thomas Grumbly, SoAR's president. "But these advancements aren't possible without federal funding for the research needed to tackle agriculture's greatest problems. Farmers are getting hammered right now and they need innovation to at least soften the blows."

Representatives from the agricultural and science sectors reconvened earlier this year to identify research goals that can only be achieved through advancing the five science breakthroughs areas. By 2030, innovations in agricultural research like the projects highlighted in this report can:

- Reduce water use in agriculture by 20%
- Reduce fertilizer use by 15%
- Significantly reduce the need for fungicides and pesticides in plant production
- Radically reduce the incidence of infectious disease epidemics for livestock

- Reduce incidence of foodborne illnesses by 50%
- Increase the availability of new plant varieties and animal products to deliver food with enhanced nutrient content

"Now is the time to double down on federal investments in agricultural research," Grumbly said. "There are urgent needs to produce more food, fiber and fuel while consuming fewer resources and protecting public health in the face of existing and emerging threats."

The report shows how scientists funded by USDA's National Institute of Food and Agriculture (NIFA) are leveraging federal resources to advance the five breakthroughs areas. Four scientists featured in the report will meet with legislators in Washington, DC on March 27 to explain how their federally funded research is making an impact on agriculture:

- P. Stephen Baenziger, Ph.D., University of Nebraska-Lincoln—Wheat provides 20 percent of the protein and 20 percent of the calories consumed by people around the world. Wheat is a self-pollinated crop, which means it doesn't get a genetic boost by crossing inbred parent lines. Dr. Baenziger and his team are working to change wheat from a self-pollinated crop to a cross-pollinated crop to take advantage of "hybrid vigor"—hybrid offspring often have improved yields, nutrients, and tolerance of droughts and other adverse conditions.
- Archie Williams, Ph.D., Fort Valley State University—The use of cameras mounted on aerial drones has expanded to agricultural communities. Dr. Williams and his team are working with farmers to develop and disseminate applications that work with imagery provided by drones to identify problematic regions in crop fields, diagnose the issues, and provide the appropriate response.
- Raj Khosla, Ph.D., Colorado State University—Traditionally,

farmers apply crop inputs uniformly across the field—a "one-size-fits-all" approach that leads to over- and under-application of water and nitrogen in parts of the crop fields. By developing precision management techniques, Dr. Khosla and his team want to minimize nitrogen and water losses without reducing yield. The benefits are far-reaching—by using precision nitrogen management, for example, farmers can earn an additional $17 per acre.

- Matthew Ruark, Ph.D., University of Wisconsin-Madison—With the growing demand to decrease the environmental impact of agriculture, Dr. Ruark and his team collect and analyze best practices for the dairy industry to reduce its greenhouse gas emissions, lower nitrogen and phosphorus runoff—in both the Great Lakes region and across the U.S.—and boost the sector's efficiency and profits.

Other agricultural research stories featured in the report:

Genomics

- Jack Dekkers, Ph.D., Iowa State University—Using genetics to improve health and disease resistance in pigs
- Fred Gmitter, Ph.D., University of Florida—Protecting oranges by boosting resistance to citrus greening
- Jennifer Randall, Ph.D., New Mexico State University—Leveraging genetics to defend pecan trees against disease and extreme weather

Microbiomes

- Michela Centinari, Ph.D., Penn State—Harnessing soil and root microbiomes to increase crop productivity

- Phillip Myer, Ph.D., University of Tennessee—Improving feed efficiency and nutrition for sustainable beef
- Gretchen Sassenrath, Ph.D., Kansas State University—Leveraging the soil microbiome to fight plant diseases
- Kate Scow, Ph.D., University of California, Davis—Working with farmers to improve soil health

Sensors

- Ralph Dean, Ph.D., North Carolina State University—Deploying sensors to safeguard the food supply
- Katy Martin Rainey, Ph.D., Purdue University—Using drones and computer analysis to evaluate new plant varieties
- Abe Stroock, Ph.D., Cornell University—Developing sensors for precision irrigation technology

Data and Informatics

- Lingxiu Dong, Ph.D., and Durai Sundaramoorthi, Ph.D., Washington University in St. Louis—Using digital tools to help farmers plant the right seeds
- Kaiyu Guan, Ph.D., University of Illinois at Urbana-Champaign—Leveraging super computers to predict crop yields and water requirements
- Ignacy Misztal, Ph.D., University of Georgia—Developing new tools to understand animal genetics
- Robin White, Ph.D., Virginia Tech—Using computing technology to individualize livestock diets

Transdisciplinary Research

- Rufus Isaacs, Ph.D., Michigan State University— Improving bee health to benefit farmers
- Cristine Morgan, Ph.D., Texas A&M University— Improving the way scientists measure and communicate the value of soil

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