

Science for Life:

A decade of federal formula grants in New York

Whether it be investments in research to combat crop-destroying invasive species or outreach efforts to build healthier communities through local food networks, federal formula grant funds from the U.S. Department of Agriculture's National Institute for Food and Agriculture (NIFA) provide vital support for a broad base of critically important programs that address local, state and national issues. At Cornell University, no other source of continuous funding addresses such a broad array of real-time, real-world issues important to our citizens, our food supply, our environment, and our future.

Dispersed through agricultural experiment stations and cooperative extension offices in each state, the formula funds — also known as capacity funds — provide a diversity of funding opportunities for projects in response to emerging local or national issues, as well as reliable resources that enable the continuity of long-term research ventures, such as developing new plant varieties.

The federal formula grants program provides a strong underpinning of research and extension that allows America to continue to be an economic force while addressing such pressing challenges as nutrition and childhood obesity, food safety and security, climate change and bioenergy. It ensures advancements at home and U.S. competitiveness abroad.

Specific examples in New York include: 13 new varieties of disease-resistant potatoes, inexpensive hand-held sensors for detecting foodborne pathogens, a 20% reduction in phosphorous runoff from dairy farms, and trials for bioenergy crops specifically bred for Northeast climates and soils. These advances, and hundreds more, would not have been achieved without formula grants, which support research through Hatch, Hatch Multistate and McIntire-Stennis programs and extension through Smith-Lever.

A report released by the Congressional Research Service suggests that recent declines in agricultural productivity gains nationwide are in part due to declining public investment in agricultural research. Historically, formula grants have been an important contributor to agricultural research and extension at Cornell and other land grant universities, yet this pool of public agricultural funds has been steadily declining over the past three decades in relative and absolute terms.¹

The U.S. Department of Agriculture's National Institute for Food and Agriculture is a critically important source of competitive and formula-based grant funding for the applied research and extension programs at Cornell University. The formula grant programs, which are allocated based in part on rural population, include: Smith-Lever funding which supports Cooperative Extension, ensuring that new science-based knowledge is put into practice in the real world; Hatch and McIntire-Stennis funds, which support a broad range of applied research, including forestry; and Hatch Multistate funds, which support applied research across broad geographic areas that require a coordinated team approach. At Cornell, these formula funds are primarily used to support well-defined research projects of two to five-year duration, with an average amount of \$25,000/year. This means that at any one time, there are up to 250 active projects of value to diverse stakeholder groups, from farms, to businesses to the underserved. Projects can be directed strictly at research questions or combined with Smith-Lever funding to ensure the integration of the research and extension functions.

¹ Melissa D. Ho. *Agricultural Research, Education, and Extension: Issues and Background* (Congressional Research Service Report for Congress). Washington, D.C., January 6, 2010.

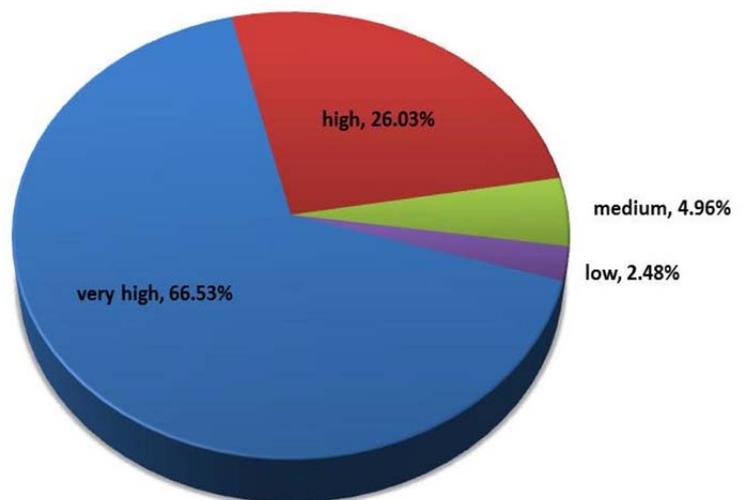
The Cornell University Agricultural Experiment Station conducted an informal survey of researchers who had received formula grant funding in support of research (e.g., Hatch funds) during a ten-year period (1999-2009). In addition to the information gathered through required annual USDA Current Research Information System (CRIS) reports, we wanted to know if the funds they received helped them to leverage additional funding from other sources, and how important the funds were to their overall research programs. The survey did not cover extension programs, which are vital to the delivery of research results and education in the state and beyond. Extension is also funded through NIFA via the Smith-Lever Act.

To help allocate formula funds to projects that are of highest priority and relevance to New York, Cornell engages stakeholders, including community planners, citizen stakeholders, business leaders, farmers, and the executive directors of Cornell Cooperative Extension offices from rural counties and major urban areas. This 43-member task force, called the Program Council, advises the two experiment stations as well as Cornell Cooperative Extension, and serves to help align the state’s needs with NIFA’s national priorities.

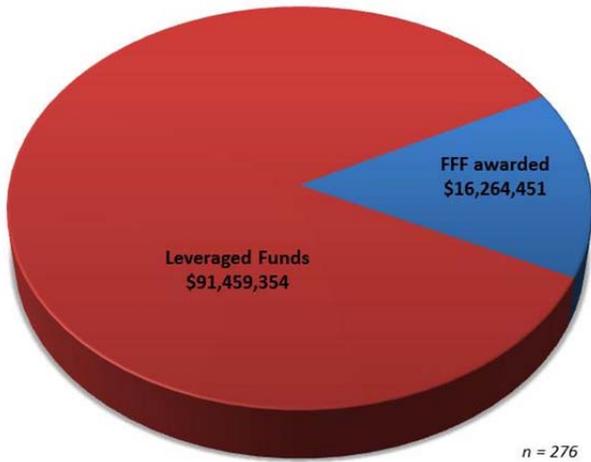
Each year, the Program Council members review more than 100 proposals early in the competitive peer-review process. They are specifically asked to rate proposals for relevancy to the needs of New York State. About 90 percent of proposals rated as highly relevant by the council stakeholders are typically funded, while the majority of those given a lower relevancy rating are rejected. The Program Council also convenes about once a year to set priorities. During these annual meetings, the members also hear progress reports about funded projects, allowing them to see the outcomes of their decisions and to gain a sense of accountability from project leaders.

More than 150 faculty members responded to the informal voluntary survey, representing a broad spectrum of disciplines and projects funded over the years. In total, the survey encompassed 276 projects - more than \$16 million in formula grants. Faculty members reported that federal formula research funds are an essential part of their research programs. More than 90 percent said these funds were of “high” or “very high” importance to their research programs.

Importance of Formula Research Funds to Researchers



Dollars Leveraged from Formula Research Grants



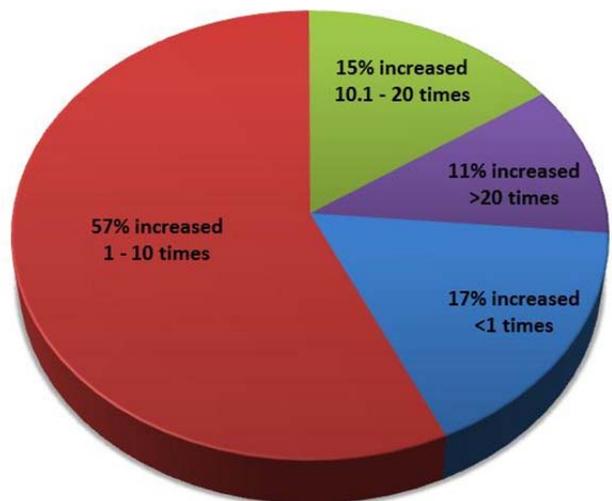
In addition to addressing a range of important and relevant issues facing New York, survey respondents reported substantial leveraging of other funding sources. More than half of the respondents were able to use the initial formula grant support to help attract subsequent funding for more in-depth research, multi-disciplinary collaborations and/or sharing their findings with the targeted audiences of the broad public. The initial funding and knowledge gained through that support helped provide them a competitive edge when seeking additional funding.

Of the \$16.3 million in funded projects over the ten-year time frame, an additional \$91.5 million in funding was subsequently secured from other sources, including private foundations, corporations, the National Institutes of Health, National Science Foundation, and several USDA competitive grants programs. For every \$1 in formula grant funding allocated to Cornell researchers, an additional \$5.62 was leveraged from other sources. If considering only the group that reported leveraging additional funds, the ratio of formula grant funding to leveraged dollars was approximately 1:9.

Of those who leveraged funds, 11% increased research dollars by more than 20 times the original grant, while more than half – 57% – multiplied the initial investment 1 to 10 times.

One Cornell nutritionist who received a \$30,000 per year Hatch grant to conduct studies of a human genetic variation affecting the metabolism of the vitamin folate was able to successfully secure an additional \$5 million from the National Institutes of Health, which led to the discovery of genes and diets that affect birth defects and colon cancer risk in humans. Another food safety scientist used a Hatch grant to develop an assessment tool for the potentially lethal *Listeria* bacteria, which led to an additional \$2.9 million grant from NIH and other federal agencies to develop methods to minimize *Listeria*'s ability to multiply in foods. His work has also helped government agencies create new food safety regulations.

Leveraged Funds Increase Compared to Initial Investment



THE MULTIPLIER EFFECT

Land-grant institutions like Cornell provide a built-in mechanism—a strong extension system—to spread the word about the latest scientific findings directly from researchers to communities, businesses, and agricultural community and farms, which multiplies the impact so discoveries don't just “sit on the shelf.” Results from the survey show that researchers who receive formula grant funds often make discoveries or identify social trends that benefit families, communities and industries. Most importantly, they are able to share their findings directly with people who need them.

One Cornell animal scientist discovered a way for dairy farmers to increase milk production in lactating cows by 5 percent thanks to Hatch fund support. He subsequently secured Smith-Lever funding for extension and outreach programming, enabling him to spread the word about the economic benefits of milking cows more often during the first three weeks of lactation. His recommendations are now widely practiced by small and mid-sized dairy farms in the Northeast, and the initial \$72,000 in funding was parlayed into an additional \$1.1 million private-sector industry grant to study bovine metabolism.

LONG-RANGE INVESTMENTS

As a nation, we have a productive agriculture sector that is the envy of the world, but there are fewer and fewer universities with active plant breeding programs at work to keep America's crops competitive in the global market. Cornell's College of Agriculture and Life Sciences has invested heavily in plant breeding to maintain and improve the quality and competitiveness of vegetable, fruit and field crops with the aid of dozens of researchers.

Many plant breeding programs take a decade from first cross to release of a new variety, and these programs are critical to keeping ahead of emerging diseases and supporting a sector that is responsive to biotic and abiotic stresses, producer need, consumer demand and rapidly changing market forces. Plant breeding research does not fit into the relatively short framework of traditional national competitive grants programs, which is why formula funds are so critical.

One Cornell geneticist uses formula funds to support a long-term field program, where he tests varieties of small grains for traits like sprouting and disease resistance. To date, his work has led to the development of new varieties of wheat, oat and barley that reduce the need for pesticides, enhance crop quality and increase farmers' competitiveness in the marketplace. Similar breeding programs focus on corn, beans, berries, potatoes, and many more are supported with Hatch funding.

A recent report from the Congressional Research Service that examined public funding for agricultural research programs noted the important role of formula funds: “Although all federal sources account for 30% or less of total funding for the experiment stations (including grants from non-research agencies within USDA and from other federal departments), the reliability of the formula funds has resulted in them traditionally being used to support the core ongoing research programs of the state agricultural experiment stations, which underpin academic programs at many universities.”¹

At Cornell, the federal formula funds have supported plant breeding, soil health, IPM, water quality, agribusiness/marketing, nutrition, and food safety programs, among others.

BIG THINGS FROM SMALL BEGINNINGS

Formula grants support applied research projects, which address immediate problems but also often produce results that lead to more extensive research, or wider application of findings. Without these critical funds, Cornell scientists would miss out on clues that often come to light through applied research and lead to larger breakthroughs.

- A prime example occurs in the study of climate change. Cornell climatologists, ecologists, and other scientists have used Hatch funds to document changes in the dates that lilacs bloom in the Northeast, changes in precipitation and storm patterns, and shifts in the migration patterns of swallows. These studies lead to critical understanding of the trajectory and impacts of climate change in New York, the Northeast and across the United States.
- Another discovery by a Cornell hydrologist led to new methods for determining water quality and quantity in rural areas. His initial Hatch-funded work helped to attract an additional \$1 million in government funding, which he used to build hydrology models now used by the U.S. Geological Survey, the Natural Resources Conservation Service, and the New York State Department of Environmental Conservation, among others.
- A Cornell biological engineer used a formula fund grant to develop a biosensor that allows New York food processors to detect food pathogens, then discovered this same technology could help create a simple and affordable immune-system test for people infected with HIV in the developing world. She is now part of an international consortium funded by the Bill and Melinda Gates Foundation working to develop methods to assess immune system factors for patients in developing countries.
- Using genetic and microbial research methods, a Cornell horticulturalist identified apple rootstocks on a Cornell farm resistant to a disease that poses a major barrier to growing organic apples. Today, apple growers throughout the United States, Europe and New Zealand are rapidly adopting the disease-resistant rootstocks in their commercial orchards.

RESPONDING TO EMERGENT NEEDS

In 2004, the West Nile Virus had been detected in 48 states and was considered endemic. Cornell researchers used Hatch funds to gather the first new local information on mosquitoes since the 1960s. Then, using the Ithaca, N.Y. population as the basis for their studies, Cornell researchers determined there was a general lack of knowledge about mosquito vectors, treatment and mosquito breeding among residents, who are the first line of defense against the spread of the disease. Smith-Lever funds were used to help Cornell issue fact sheets on the virus, mosquito biology, and what residents and homeowners can do to minimize mosquito breeding grounds. These are now available internationally through Cornell's website. Hatch funds have also strengthened the research capacity of the food safety program at Cornell—ranked top in the nation—to quickly respond to nationwide or regional outbreaks of foodborne illness.

MULTI-DISCIPLINARY RESEARCH

In today's complex world, breakthroughs that yield improvements for society frequently involve experts from multiple disciplines, who hold varied perspectives of how to address a common challenge. The Cornell survey showed that Hatch funds have allowed researchers to effectively leverage expertise across institutions.

For example, Cornell researchers from several fields are using Hatch funds to address the obesity epidemic among children and families in the U.S. A Cornell nutritionist has found a link between maternal obesity during pregnancy and larger babies, while another is training cooperative extension educators to tackle obesity in communities from an ecological perspective. A marketing professor at the Charles H. Dyson School of Applied Economics and Management has made numerous discoveries about eating behaviors that explain why people overeat. And a social policy expert is examining how the lifestyles of parents and caregivers influence children's eating habits.

Climate change is another far-reaching challenge under study by a broad spectrum of Cornell researchers who are working together to develop responsive tools to help farmers, community planners, and policy makers. While social scientists examine how citizens respond to messages about climate change to help policy makers and scientists create better tools for communicating scientific discoveries, an ecologist is training local organizations to make scientific observations that detail the effects of climate change on native plant species to help determine how a variety of species are impacted by warming temperatures. Another scientist recently secured Hatch funds to supplement a \$4.7 million multi-disciplinary Agriculture and Food Research Initiative (AFRI) grant to create new tools for farmers nationwide to account for, and manage, greenhouse gases and carbon on the farm. While the AFRI grant is focused on corn, the Hatch funds will be used to encompass other economically important fruit and vegetable cropping systems.

Hatch funds are crucial for helping land-grant universities create useable tools for society to tackle these types of broad problems from a variety of perspectives.

CONCLUSION

Federal formula funds from the USDA's National Institute for Food and Agriculture provide a critical funding source that tackles widespread problems across a range of disciplines and allows Cornell to leverage additional funding. Cornell's stakeholder-driven allocation system ensures Hatch, Smith-Lever and related federal formula funds support research and extension that targets real-world problems, impacts broad swaths of society, improves the environment, and enhances the economy. The Cornell survey showed the degree to which formula grant research funds (Hatch, Hatch Multistate, and McIntire-Stennis) have supported cutting-edge applied research and academic programs that educate students. The reliability of these funds has enabled the Cornell University Agricultural Experiment Station and the New York State Agricultural Experiment Station, in close partnership with Cornell Cooperative Extension, to support many of the agricultural, environmental, health and rural development programs that underpin the New York economy, and to respond to emerging problems facing our nation.