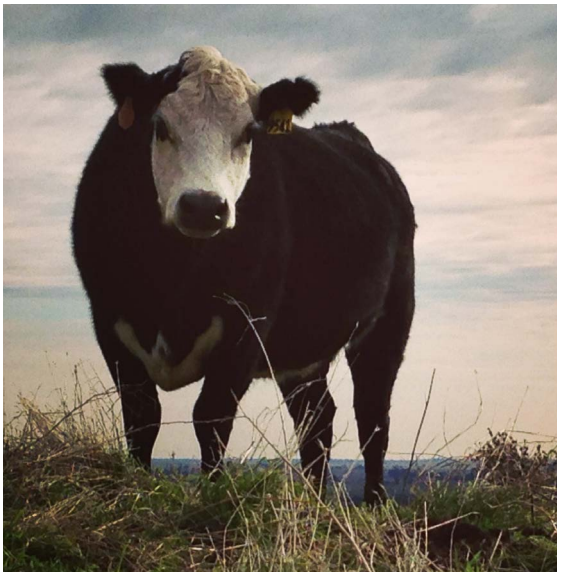
National Animal Genome Project

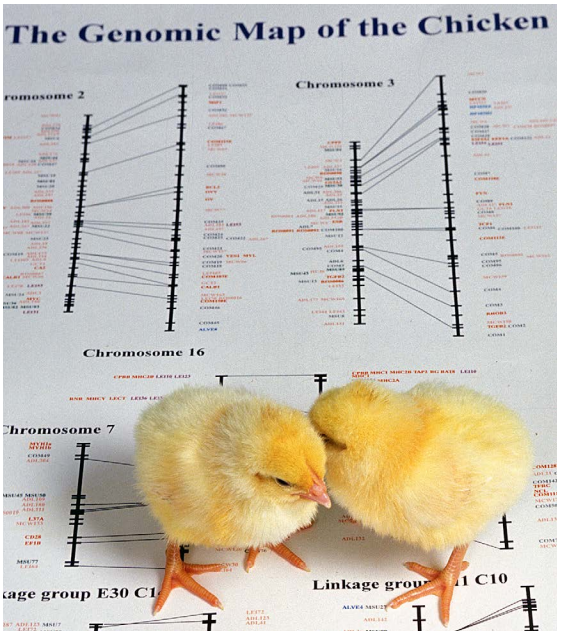
NRSP-008 (2008-2013)

Who cares and why?

Over the next 20 years, demand for meat and dairy products is expected to increase 40% to 50%. Animal agriculture must evolve quickly in order to meet future production needs. Genomics—the study of an organism's entire sequence of genes—is a driving force behind innovative agricultural technologies and practices. Using genome information to adjust breeding practices can lead to animals that are healthier, faster-growing, disease-resistant, and adapted to stressful or changing environmental conditions. Addressing these challenges can reduce costs and losses for farmers and improve public health. Higher-quality products can also increase consumer satisfaction. Furthermore, genomics can highlight new ways to manage animal agriculture systems so that they are more efficient and environmentally-friendly. However, animal genome research is complicated and costly. Tools and gene sequence information are often unaffordable for individual researchers or single institutions. Some scientists may be unfamiliar with newly-available technologies and reluctant to adopt them. In order to advance animal genome research and the variety of possible uses, collaboration among researchers is essential.



Studying the genome of cattle has provided insights into health and physiology that are being used around the world to advance the genetic improvement of cattle (above, photo by Antonio Medrano). Similarly, the genomic map of the chicken has laid the foundation for poultry biotechnology (below, photo by USDA-ARS).



How did this project enable research?

Since 1993, NRSP-8 has supported the National Animal Genome Research Program, which has played a major role in genomic discoveries in farm and aquaculture species. NRSP-8 participants represent 37 universities, three government agencies, and four private research institutions. By bringing together researchers, setting up an efficient system for sharing resources, and leveraging diverse funding, NRSP-8 has overcome barriers due to cost and lack of expertise. In particular, better access to state-of-the-art tools, genome maps, gene sequence information, and other data have stimulated new research avenues and capabilities. NRSP-8 support and member input has led to genome sequences of many agriculturally-important species, including pigs, horses, cattle, chickens, sheep, Pacific oysters, and many fish. By identifying variations between the DNA sequences in animals of the same species, researchers have been able to determine how these differences lead to different traits in the animals. Using the technology and information made available by NRSP-8, independent research laboratories and commercial breeding companies have determined the genetic makeup of thousands of animals. Researchers have also located genes associated with specific traits related to growth, feed use, fertility, stress tolerance, and meat tenderness and have made strides in understanding the role of genetics in a wide variety of infectious diseases and inherited disorders. Coordination has also helped maintain special populations of crossbred and inbred animals for intensive study. To deal with the massive quantities of information that have grown out of such research, NRSP-8 members have developed tools for efficient data storage, sharing, and analysis. They have also co-authored hundreds of peer-reviewed publications, organized conferences, and published newsletters and outreach materials that connect their research with industry members, farmers, and other stakeholders.

How did this project leverage funds?

Funding source	This money has been used to:
Coordination funds	• finance meetings, workshops, and travel grants • create statistical and computer tools • develop genotyping tools for pigs, horses, cattle, chickens, and sheep • produce *Animal Genetics* issue
Competitive grants ($22.4M federal; $6.9M non-federal)	• support the majority of cattle and aquaculture genome research • standardize the new Livestock Product Trait Ontology
Industry ($1.9M)	• study cattle genome • develop gene tests to improve pig production • store and disseminate data
Academic	• sequence genomes for cattle, pig, horse, sheep, chicken, and turkey

Genomic tools developed by NRSP-8 are being used to breed horses that are healthier and can perform better (top, photo by Allen Page Photography). Genetic discoveries about growth, feed use, disease resistance, and meat tenderness in fish, cattle, and pigs (bottom, photo courtesy of PIC) help assure a supply of high-quality food products, like salmon steaks (right, photo courtesy of Andrea Pokrzywinski, Flickr).

Impact Statements

Fostered collaboration and sharing among scientists and government, academic, and industry stakeholders worldwide.

Developed cutting-edge, economical tools and techniques used by animal genome researchers worldwide. For example, new databases help researchers and farmers manage data and select proper animals for studies and breeding.

Increased customer satisfaction through genetic discoveries that help farmers breed animals with improved growth, taste, tenderness, and nutritional qualities.

Provided information needed to breed animals with better stress tolerance and disease resistance, thus reducing losses for farmers and protecting public health.

Provided genome information for rare, endangered, and wild animals, helping preserve their global heritage.

Advanced human genetic and biomedical research through studies that revealed new similarities between animals, especially pigs, and humans.

Want to know more?

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National Research Support Projects (NRSPs) are funded collectively by Agricultural Experiment Station directors' contributions from federally appropriated funds for multistate research. The Hatch Multistate Research Fund was established in 1998 by the Agricultural Research, Extension, and Education Reform Act (an amendment to the Hatch Act of 1888) to support research activities that address high-priority issues facing U.S. agriculture, natural resources, food and nutrition, and rural communities. Drawing on the strengths of the land grant universities and their partners, NRSPs have a unique capacity for enabling multidisciplinary, multistate collaboration and leveraging funding from far-ranging sources.

Written and designed by Sara Delheimer