

This Issue Paper is part of the CAST Series “The Need for Agricultural Innovation to Sustainably Feed the World by 2050.” The 12-part series focuses on the dramatic changes needed to accelerate productivity in crop and animal systems while reducing negative impacts on the environment.

*Forthcoming CAST Issue Paper:*

**THE NEED FOR AGRICULTURAL INNOVATION TO SUSTAINABLY FEED THE WORLD BY 2050:**

**PROTECTING FOOD ANIMAL GENE POOLS  
FOR FUTURE GENERATIONS**

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**Need**

The world’s population increased from 3.1 to 6.3 billion people in the last 40 years and is expected to reach more than 9 billion by 2050, creating a grand societal challenge: ramping up agricultural productivity to feed 9 billion people. With the need to ramp up agricultural productivity, animals continue to be an important source of protein. Meat, milk, and fish products are keys to the world supply of protein, but genetic diversity of livestock is fading. This paper addresses the vital need to protect genetic diversity in a time when disease or future climate change could unexpectedly decimate the small number of breeds the world depends on for food.

Genetic diversity serves as a way for populations to adapt to changing environments. Thousands of years of human intervention in selectively breeding animals have resulted in breeds that have distinct advantages, such as resistance to disease or tolerance for limited water. This diversity is important for food security in the event of unforeseen circumstances such as disease outbreaks (e.g., avian influenza) or natural disasters. However, the genetic diversity of livestock is being lost—the number of breeds has declined markedly over the past half century as intensive farming practices have focused on a narrow number of high-producing breeds (e.g., Holstein cows for milk production). In fact, up to 30% of global mammalian and avian livestock breeds (1,200 to 1,500 breeds) are currently at risk and, if lost, cannot be replaced. This loss of genetic diversity is dangerous because disease or future climate change could unexpectedly decimate one of the handfuls of animal breeds we depend on to feed our growing planet.

In the face of the mounting depletion in genetic diversity among livestock species, there is an urgent need to develop and maintain an intensive program of sampling and evaluation of the existing gene pools in livestock, poultry, and fish. The USDA’s National Animal Germplasm Program (NAGP), while providing the framework for coordination of germplasm collection and for some monitoring and inventory of livestock breeds through six species committees, is not supported at a level that permits active involvement in animal genetic resource management or preservation. This situation is not unique to the U.S. In 2010, the Food and Agriculture Organization of the United Nations (FAO) undertook a global study of the status of national gene banks and determined that fully operational gene banks were present in only 20% of the countries, although most of the remaining countries reported plans to establish national gene banks within the next five years. A lack of finances and low priority in national livestock policies were cited as the most common factors hindering the establishment or operation of gene banks.

## Goals and Objectives

- Identify and define what types of animal resources (e.g., commercial lines, minor breeds, research strains, transgenic stocks) should be considered for long-term germplasm preservation, and describe the state-of-the-art preservation methodologies for those animal resources with special emphasis on gaps in knowledge and/or application.
- Describe the existing operations for food animal germplasm preservation within the U.S., including the NAGP and private organizations.
- Identify the resources needed to develop a highly efficient and fully optimized national germplasm repository, including a contemporary comprehensive census of existing breeds and strains remaining in the U.S., a strategic national plan for prioritizing the collection of germplasm, and targeted research programs to improve cryopreservation methodology for poultry, small ruminant, and aquatic species.
- Frame a realistic plan to develop the necessary resources and to maintain the long-term operational continuity of a highly efficient and fully optimized national germplasm repository.

## Methodology

A CAST Issue Paper is written by a volunteer task force composed of a multidisciplinary team of scientists and subject matter experts who were identified as part of the proposal development process. Once written, qualified scientists edit and peer review the paper to ensure balance and scientific credibility. A one-page executive summary (the Ag quickCAST) is written and released simultaneously with the issue paper. The task force chair shares key findings of the paper and related recommendations at an appropriate venue selected for the release of the publication. CAST Issue Papers are often released in Washington, D.C., or at selected scientific or industry-related events and meetings. CAST staff coordinate press releases and invitations to key stakeholders to attend and participate in its release. In addition to the continued dissemination of the issue paper, CAST staff track, collect, and share media impressions and other relevant data.

## Intended Audiences and Impact Strategy

The intended audience and impacted stakeholders for this paper include policymakers and regulators, nongovernmental organizations, industry and private livestock breeders, and the general public. CAST efforts to reach these audiences involve the dissemination of printed materials and the use of web and social media promotions. This includes preparing and distributing news releases using media services such as Meltwater Press (1,500 journalists), Constant Contact (CAST lists of more than 7,500 contacts—1,053 of which are media), and PRWeb (2,900 media outlets). CAST also highlights and shares the availability of this information through its weekly e-newsletter, *Friday Notes* (1,125 contacts), and direct mailings to impacted stakeholders and organizations. These issue papers and related resources are maintained on the CAST website and available for download at no cost.

## Cost of Producing a CAST Issue Paper—\$30,000

- CAST production expenses of task force personnel research, setup, and management
- Editorial work, including creation of companion Ag quickCAST document
- Web and social media promotion, including preparing and distributing news release using Meltwater Press, Constant Contact, and PRWeb
- Preparation for, hosting of, and travel costs of rollout events (often in Washington, D.C.)
- Impact tracking and reports
- Support materials and supplies
- Online narrated PowerPoint presentation and website posting and monitoring
- Professional layout and graphics preparation
- Printing by a commercial printer
- Mailing costs to send printed copies to selected categories of stakeholders

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