

# ARS National Research Programs in Genotyping and Phenotyping

**T**he Agricultural Research Service is a leader in developing and using genetic data and the physical traits it guides to help improve agriculturally important animals, crops, ornamentals, insects, and microorganisms.

Genotyping/phenotyping can generally be placed under the umbrella of genomics. ARS research in this area is mainly concentrated in its national programs for Food Animal Production (#101) and Plant Genetic Resources, Genomics, and Genetic Improvement (#301), both described on the Web at [www.nps.ars.usda.gov](http://www.nps.ars.usda.gov). But genomics research has very broad applications, and research projects often involve extensive collaborations with other ARS national programs, such as Animal Health (#103), Plant Diseases (#303), Aquaculture (#106), Food Safety (#108), Bioenergy and Energy Alternatives (#307), and others.

Because of the huge potential that genomics offers for improving crops, ARS has recently set a goal of developing genomic libraries with genotypic and phenotypic information for all the accessions in the National Plant Germplasm System. This is a massive but achievable task that will open a vast array of possible crop improvements.

On the livestock and poultry side, ARS is leading a major effort, putting genetic information to work to improve efficiency of animal production, especially for feed use. The aim is to reduce costs for producers and consumers and to reduce the environmental impact of agriculture. Research projects will also use genetic-sequence data to develop a better understanding of the host/pathogen relationship for the most dangerous animal pathogens and to enhance our understanding of the immune response to enable improvements in vaccines and postvaccine technologies.

ARS genetics programs are also coordinating development of new informatics tools for managing, collecting, storing, retrieving, and analyzing the large data sets being generated by genomics. This includes promoting the integration of “-omics” data with large-scale phenotypic studies and software to incorporate genome-level data into national and international genetic evaluation programs. ARS is also supporting standards of data validation and quality assurance as well as promoting accessibility of published data.

The goal is to maximize use and usability of genetic data, avoid duplication, and leverage developments from other research communities. ARS is also promoting development and evaluation of technologies for rapid assessment of genomic diversity to guide the choice of candidates for whole-genome sequencing. ✱

