

NSIP Technical Committee Report

July 2015

In early June, a funding application was submitted to the USDA-NIFA Agriculture and Food Research Initiative Competitive Grants Program in the Food Security Challenge Area. It would support a large-scale sheep genomics project that would involve close collaboration with NSIP and its member flocks. The grant application is entitled “Engaging young scholars in shaping new methods for genomic selection: integrating quantitative and molecular genetics using sheep as a model.” The abstract of the application has been included at the end of this report. Approximately \$3 million in support is being sought. The USDA-NIFA review process is expected to be completed by Oct. 15, 2015, with funding decisions announced shortly thereafter.

The proposed work is strengthened through several strategic partnerships. Our External Advisory Committee will include stakeholders from key US sheep industry organizations – NSIP and the American Sheep Industry Association – similar groups in the beef and swine industries, and sheep breeders. Partners at 1890, Tribal Colleges, and other academic institutions will facilitate undergraduate student recruitment, and 27 sheep enterprises committed to participating in an externship program and on-farm data collection proposed in the application. Key participants (18 total) from the USDA Agricultural Research Service [Dale Bumpers Small Farms Research Center, US Meat Animal Research Center], universities (Louisiana State Univ., Michigan State Univ., Univ. of Idaho, Univ. of Nebraska-Lincoln, Virginia Tech, West Virginia Univ.), and commerce (Neogen/GeneSeek) will combine their knowledge and experience to conduct the molecular and quantitative genetics research and educational programs.

Abstract

A key challenge in livestock industries is predicting genetic predisposition for disease susceptibility and carcass lean content, both difficult-to-measure traits impacting product safety and quality. Molecular tools can effectively address that challenge, but their implementation is difficult in industries such as US sheep, where commodity prices limit on-farm recording. Our long-term goal is to develop effective strategies to incorporate genomic data into genetic evaluation programs in sheep and other livestock. Using sequence data on US sheep breeds, we will identify loci for genotyping assays reflecting genetic diversity (Objective 1). Through gene expression studies, we will find genes and gene pathways contributing to parasite resistance in Katahdin sheep and carcass lean content in Suffolk sheep (Objective 2). We will then build a robust, cost-effective low-density array. Using simulation, we will develop genotyping strategies decreasing bias and improving accuracy of genomic prediction (Objective 3). With stakeholders, we will test these tools by engaging undergraduates from diverse backgrounds in on-farm and laboratory experiences (Objective 4). We address Program Area Priority A5161, Breeding and Genomics of Crops and Livestock, within the AFRI Food Security Challenge Area. Our genotyping methodologies address the needs and challenges identified by producers (Objectives 1-3), and we will improve use of genetic information to improve the diversity and resilience of our production system (Objective 2). Integrating students, stakeholders and scientists, we will establish an infrastructure for transformational science, positively impacting rural economic development and prosperity while enhancing regional and national resilience and food security (Objective 4), an overarching AFRI priority.

Ron Lewis
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