NRSP-8 BUDGET JUSTIFICATION FOR 2013

OVINE

NRSP-8 funds have contributed to the development of resources that advance research in sheep genomics. For many of the resources, the NRSP-8 money served as the initial seed for projects that were subsequently funded from other sources, including USDA grants.

Ovine genomic resources that have been funded at least in part by NRSP-8 funds include a high coverage BAC library, end-sequencing of 100% of the BAC library, a radiation hybrid panel and high resolution whole genome RH map, an integrated ovine genetic map, development of a virtual sheep genome (http://www.livestockgenomics.csiro.au/sheep/vsheep.php/), a whole genome BAC physical map, a high density 50K SNP array, and a global diversity panel of commercially important and rare sheep breeds. Most recently, NRSP-8 funds have contributed to the development of an ovine whole genome reference sequence. The sequence was released to the public in February, 2011 (http://www.livestockgenomics.csiro.au/sheep/oar2.0.php).

BOVINE

NRSP-8 was established to provide a venue for cooperation and resource sharing among U.S. investigators working in animal genomics research. The species coordinators play an important role in this process by coordinating the accessibility of resources for young investigators, and in providing leadership and support in the development genomic tools. The funding provided to coordinators has been essential in achieving these goals.

In bovine, NRSP-8 seed funding and collaboration was important in bringing groups and resources together for the development of the bovine genome sequence and the structural genomic resources currently in use. The application of genomics provides an opportunity to develop sustainable animal breeding programs based on the understanding of traits that affect reproduction, health, efficiency, product quality and animal well being. For this to be accomplished we need to be focused in promoting research leading to the understanding of the underlying causes and interactions of quantitative traits that determined economic value in livestock. Funding in bovine will be used for travel to national and international meetings to promote collaborations among investigators and to have a presence in international projects, such as the European Quantomics initiative. Funding will also be utilized to support the improvement of the genome assembly, gene annotation, epigenomics, imputation (1000 cattle genome project), genetic diversity analysis and for the development of functional genomic resources for the application of next generation sequencing and protein analysis.

EQUINE

The resources provided to the Horse NRSP8 Technical committee are used to leverage additional funds from federal, state, institution, and industry sources. The largest challenge to the investigator is to keep current with the rapid changes in the technology and advances in genomic science. The seed funding is used to provide travel support to the Plant and Animal Genome meetings for invited speakers, students and others on a need-basis. It has been used to support additional meetings directly related to the workshop. For example, every two years we receive an industry grant to conduct an additional meeting. As the workshop has grown, some NRSP8 funds have been used to provide key speaker support. In addition, we have supported participation at meeting involving animal scientists and veterinarians in order to encourage scientists working in those fields to adopt genomic technologies when appropriate and to offer collaboration. Another challenge has been to use the technology. We have funded activities to promote use of databases, learning and encouraging scientists to deposit information into public databases and to provide genomics tools, such as SNP chips, to scientists working on local projects. In addition we

develop and maintain a user- friendly website on horse genomics with dual purposes: 1) to inform the public about who is doing this work and what applications are being developed and 2) description of the resources and helpful materials for scientists who want to use genomics. This website can be found simply by "googling" Horse Genomics on a web browser. We have not used the funds indirect support of any specific research project. This separation has worked to encourage industry participation. A very important goal for use of these funds is to promote awareness of the field and tools to other scientists so that they will be more effective in their endeavors and to the industry so they will be aware of the ongoing changes and realize the value to their applications.

PORCINE

NRSP-8 funds have contributed to the development of resources that advance research in swine genomics and association studies. These include supporting wide-ranging projects that involve several state experiment stations for each species. The funding is still limited and we often carry over funding from one year to accomplish our goals – especially to assist several stations in purchase of genotyping materials (SNP chips) or in sequencing efforts. This is extremely effective because it allows PIs to get other funds based on the contribution from the Coordinator's funds. This past year four such examples occurred where a total of 7 stations were helped. This included work to supports research on two diseases PRRS and PCV2, projects on feed efficiency, sow song Gevity and production traits. At present some additional funds have been committed for other multistate projects if outside funding is secured. One other part of the funding is used for travel to develop collaborations among PIs, speak at national and international meetings and to help PIs look for new funding. All these activities are the same across species.

POULTRY

There are two major points to be mentioned. The vast majority of each committee's budget goes for "post-genomic" technical support of one sort or another, such as SNP chips, microarrays and related technology. These are used by the members to get started on a project, produce preliminary results and/or to complement limited funds they currently can access themselves. This provides a boost for these members to get over the initial activation energy hump required to begin working with a new technology, and it also nucleates community efforts. In the past FY, poultry support went most prominently to a genomic high throughput sequence genome re-sequencing project that sequenced 20 chicken lines of interest to different members; two widely used chicken cell lines and the bioinformatics processing of these large data sets with the remainder going towards miscellaneous computer costs and mostly member travel to the annual meeting.

Second, and more important, funding is used to leverage other support (AFRI/NRI, industry, international, State) in an entrepreneurial way that changes from year to year as new opportunities and technologies appear. As an example, in FY09, there was an opportunity to provide critical seed funding to the turkey genome sequencing effort at Virginia Tech. We provided $28K towards a consortium effort generating about $282K in additional funds and supplies/data from Virginia Tech, Virginia Biotech Institute, Roche, U. Minn., other companies and USDA-ARS. Together this generated enough preliminary results to attract two AFRI tools and reagents grants totaling nearly $1.4M by themselves in FY09. Similarly, poultry genomics/bioinformatics research generated over $1M in NIFA support in the FY10 round.

Overall, poultry committee members estimated nearly $7.5M in collateral support (almost $6M Federal, about $0.5M State and nearly $1M industry) in the 2009 survey, about $4.8M in the 2010 survey, and about $7.5M in Federal funds and $60,000 in Station funds in 2011. In particular, this probably grossly underestimates the amount of industry funding (and in-kind effort and supplies) into GMAS and SNP genotyping research related to projects that include at least partial coordinator support (not counting

extensive effort by the co-coordinator who has led these two projects). It's difficult to estimate the fraction of this money that supports public vs. proprietary research, and companies are not always willing to disclose the details of their support for some of these projects.

AQUACULTURE

Aquaculture is an underfunded sector of agriculture. Aquaculture genomics is a highly specialized field where the need to train the next generation of scientists is crucial. We provide travel awards to help graduate students and postdoctoral fellows participate scientific exchange and discussion at national and international platforms.

Funding is also provided to support poster session presentations, invited speakers ad various events and for species coordinators travel to attend various meetings including the PAG Aquaculture workshops.

In addition to supporting species-specific workshops and informatics training sessions funds are used to provide species-specific reagents and for the sharing of BAC libraries, primers, kits and other reagents.

BIOINFORMATICS

Funds will be utilized to pay for Zhiliang Hu's salary (100%) along with a part-time database curator (12.5%), who will work to meet the needs of the NRSP-8 research community in the area of bioinformatics. Travel funds will be used to cover expenses associated with NRSP-8 activities including work on NRSP-8 computers and attendance at the NRSP-8 annual meeting in San Diego, CA and to cover travel expenses of NRSP-8 members to international conferences. Funds will be used to fund external research projects at other institutions that meet the goals of NRSP-8 and to cover costs associated with hosting the NRSP-8 computers (Infrastructure).