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NCCC170: Research Advances in Agricultural Statistics

Approved

(Multistate Research Coordinating Committee and Information Exchange Group)

Duration: October 2011 to September 30, 2016
Administrative Advisor(s): [John Boyer, Jr. (research)]
NIFA Reps:

Statement of Issues and Justification

Statisticians who consult and do research in an Agricultural Experiment Station environment have a unique relationship with the University. Their multi-disciplinary, collaborative role is generally more extensive than that of other faculty within the University and often cuts across several departments or units. Collaboration of statisticians and scientists allows land grant institutions to perform their agricultural research missions more effectively and efficiently than would otherwise be possible. Statisticians at each station tend to specialize in specific areas. This multi-state committee provides a mechanism that brings together statisticians from many stations working in related areas. The resulting exchange of ideas and the sharing of knowledge is of benefit to all project members and to the institutions they represent.

As State and Federal appropriations continue to fall short of levels needed for research and grants become more competitive, it becomes even more imperative that research dollars go as far as possible. This requires Experiment Station statisticians to keep abreast of the latest statistical research as well as to work to develop methodology appropriate to their consulting roles. Advances in the complexity of designed experiments and observational studies along with a broader range of qualitative and quantitative types of data being collected in increasingly larger quantities require new methodologies for proper design and analysis to insure the quality of the data and the inferences drawn from them.

Never has the charge to remain current in the statistical profession been more challenging. Assessing the utility of the new statistical methods, many of which are computationally intensive, and the associated software is increasingly important. Further, dissemination of the information to agricultural researchers must be made in a timely manner. Thus, it is critical that Station statisticians work cooperatively to determine the best current approaches to common statistical problems and to help guide future directions of statistical research and software development.

In this respect, Experiment Station statisticians and their counterparts in government and industry can work together to provide more effective assistance to the agricultural researchers of their respective states. This NCCC committee can play an extremely important role by serving as a focal point for the development and implementation of sound statistical practice, thereby improving the quality of research in the agricultural sciences. Thus this committee is a support project that ultimately assists agricultural researchers in other disciplines in their efforts to accomplish national research priorities. The members of this NCCC are committed to this goal.

Objectives

1. To identify, foster and coordinate cooperative research efforts in statistics among statisticians serving food and agriculture research programs
2. To address the statistical design and analysis issues associated with studies involving technologies that typically produce a large number of spatially and/or temporally correlated observations per sample but few samples (e.g., gene and protein arrays, metabolomics, mass spectroscopy, chromatography and precision agriculture)
3. To address concerns associated with the development and implementation of generalized linear mixed model techniques and software used by statisticians and researchers
4. To address meta-analysis issues associated with multi-location, multi-investigator projects including those in which study treatments and/or designs may differ by location
5. To facilitate the rapid transfer of new statistical methodologies and developments to statisticians and researchers in Experiment Stations, USDA, and industry, with emphasis on outreach and collaboration

Procedures and Activities

Since its inception, NCCC-170 has addressed a series of statistical topics using the following general procedure. At each annual meeting, the members discuss current research projects at

their university or research station and the statistical issues associated with them. These topics are compiled and when appropriate, the members use this information to decide on a statistical topic to be addressed by the group in the next project cycle. Once that decision has been made, a three or four year cycle begins.

The first and, if necessary, second year of the cycle are devoted to educating the project membership on the chosen topic. This is accomplished primarily through the annual meeting technical programs presented by knowledgeable project members and, on occasion, non-members (usually located at that year's meeting site). Once this phase has been completed, materials are developed for members to use in their research, education and outreach activities. These may include workshop materials for subject matter audiences, software and usage instructions for data analysis, and statistical material for members own continuing education. Material development is carried out by a subcommittee of volunteers from the project membership. A draft of their work (e.g., a dry-run of a workshop) is presented at the next annual meeting to obtain feedback from the entire group. During this meeting, a decision is made regarding whether or not a final version needs to be presented the following year.

Over the past nineteen years, project members have dealt with statistical aspects of on-farm trials, mixed models, spatial statistics, and generalized linear mixed models. They have developed mixed model workshops for both statistical and subject matter audiences and a spatial workshop for subject matter audiences. These workshops have been successful and continue to be updated and offered even after the project focus has moved to a new topic. A generalized linear mixed model workshop was offered for the first time at the American Society of Agronomy annual meeting in 2010.

In addition to these group outputs, these discussions have also impacted project members' collaborations at their own institutions and have led to numerous refereed and non-refereed publications, participation in competitive grants and presentations at professional meetings. The Literature section lists publications from the project's 2010 Annual Report as examples of these individual outputs.

The initial years of this project renewal will focus on the continuation of generalized linear mixed model problems with an emphasis on computing issues and the analysis of data sets with high dimensional observations coupled with both small and large sample sizes. Meta-analysis issues for multi-location, multi-investigator studies will be a new focus.

Expected Outcomes and Impacts

- Education of members leading to cooperative research efforts and improved consulting and teaching by individual members.
- Cooperative research efforts among some members and information exchange on new developments among all members in the areas of spatial statistics, generalized linear mixed models, and the analysis of high dimensional, large volume data.
- Continued offering of workshops to educate subject matter scientists on valid design and statistical analysis of studies involving spatial statistics, linear mixed models, and generalized linear mixed models.

Projected Participation

Include a completed Appendix E

Educational Plan

Members will educate their individual clientele of subject matter scientists and students in one-on-one and group settings as they deem appropriate. Workshops will continue to be offered to regional and national subject matter groups.

Organization/Governance

The Chair and Secretary are elected by the members present at the annual meeting. The meeting Local Arrangement Chair for the next year is the member from the state in which the meeting will be held. The meeting Program Chair for the next year is a volunteer from among the members present at the annual meeting.

Literature Cited

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Attachments

[NCCC170Renewal-IssuesJustification.doc]

Land Grant Participating States / Institutions

AR, FL, ID, IL, IN, KS, MI, ND, OH, OK, PR, SC, UT, VT, WI

Non Land Grant Participating States / Institutions

Louisiana State University, Monsanto, NPA, Pioneer Hi-Bred International, SPA, USDA-ARS-NSTL, USDA-ARS/TX

Signatures: