

Some Reflections on IASRI's Support to Research and Development in Agriculture

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The institute has grown up from Statistical Wing (1930) in the Ministry of Agriculture to an institute IARS (1959) which was further renamed as IASRI (1978). IASRI's focus has been in research and training to cater to the need of science, society and environment in the agricultural sector and other inter-connected sectors in □□□□/India and internationally. The IASRI has developed theories, practices and educational tools in areas of sample surveys, design of experiments, genetical statistics, data storage and retrieval and statistical information systems using ICT tools to strengthen agriculture and farm animal research. The accomplishments of the institute are numerous and cannot be accommodated here, I therefore list only a few resulting from my limited recollections and interaction with my peers and colleagues at IASRI.

Innovative ways of use of auxiliary information in sampling and sampling on successive occasions were developed during its early years. An innovative experimental design, called re-enforced design, to suit to experiment in incomplete blocks was introduced by Professor M.N. Das (1958). Later another class of incomplete blocks with nested rows and columns were developed to control, relatively more effectively, inherent variation in experimental material (Singh and Dey, 1979). This class of designs was further developed to suit much higher numbers of treatments and with variable degree of balanced-ness. Other classes of experimental designs were obtained as n-ary designs by Murthy and Das (1967) and Dey (1970), optimal nested row-column designs (Parsad et al 2001) among others. Valuable contributions have been made in the areas of incomplete block designs with partial balance applied to plant genetic studies (Arya and Narain 1977, Arya 1983), robust row-column designs for complete diallel cross experiments (Bhar and Gupta 2002), optimal designs for experiments on two-line and four-lines crosses (Parsad et al. 2005), designs for microarrays (Sarkar et al., 2007), minimally replicated PBIB designs for multi-environmental trials (Vinaykumar et al., 2023), circular block and partially balanced designs for neighbouring competition effects (Jaggi et al. 2006, 2007), designs for cropping systems research (Parsad et al., 2007), among others. IASRI statisticians have published several books to support research and applications in areas including genetic statistics, experimental designs and sampling (Singh and Chaudhary 1989, Narain 1990, Das 1964, Dey 2010, Dey and Mukherjee 1999, Gupta et al 2016 and its electronic version https://drs.icar.gov.in/Electronic-Book/design_and_analysis_of_agricultu.htm) among others.

Along with the theory, software tools for applications have been developed by IASRI to generate experimental designs and carry out statistical analysis including block designs, factorial experiments and various meta-analyses (Design Resource Server, <https://drs.icar.gov.in/>).

IASRI has developed systems to collect data from diverse platforms in agricultural research network and farmers' fields and stands as a center of excellence on collection, storage, retrieval and exploration system for genetic information from plant and animal

entities hosted at ASHOKA (Agricultural Bioinformatics Advanced Supercomputing Hub for Omics Knowledge in Agriculture, <https://iasri.icar.gov.in/ashoka.aspx>). ASHOKA is a super-computing hub of computational biology and bioinformatics to support genomics and proteomics research in agriculture leading to sustainable enhancement of agricultural productivity (Pradhan et al. 2023, Parsad et al., 2024).

IASRI is a lead center that has established systems to share its research information and to develop human resources through training and advanced degree studies at the Indian Agricultural Research Institute to serve □□□□□□ /Indian agriculture research centers and other institutions.

I congratulate IASRI personnel for keeping up to the challenges of the time, and my best wishes to continue to address the emerging situations of experiments, surveys (including use of satellite imagery) and genetics including finest level/details as we move with time. An obvious extension for ASHOKA could be the direction of integrating design resources with voice interfaces to access the data files and analysis aspects using open source languages, and optimizing the resources in terms of AI usage.

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