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A Note on Sukhatme's Influence on Development of Statistical Methods in Animal Science Research

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SUMMARY

The contribution of Prof. P.V. Sukhatme in the field of animal science research is highlighted. The impact of his contribution leading to the creation of Division of Biometry at the Indian Agricultural Statistics Research Institute (IASRI), New Delhi for both theoretical and applied statistical genetics research is also reviewed.

Key words: Animal science research, Sire index, Quantitative inheritance, Statistical genetics, Biometry.

1. Introduction

Prof. P.V. Sukhatme made significant contributions in many spheres of science including statistics, nutrition, genetics, education, sociology, poverty, yoga as well as philosophy of life. While his contributions in most of these areas are well known and documented, his influence directly as well as indirectly, on statistical methods in animal science research and in genetics and breeding are not so adequately recorded. The purpose of this note is, therefore, to highlight such aspects relating to his very earlier pioneering work in animal husbandry improvement programme which not only had sown the seeds for future research but also helped in understanding the phenomenon of response to selection for achieving genetic improvement in characters of economic importance.

2. Statistical Methodology in Animal Science Research

Prof. Sukhatme's [3] first study, in fact his first assignment on joining ICAR as statistician in 1940, related to the analysis of data collected under a project on evolving a suitable breed for improvement of milk yield of goats at Etah Goat Breeding Station. Under this project, utilizing the data over 10 years, Dr. Slater who headed this project concluded that the improvement in milk yield over the years was genetic. In order to have a critical appraisal of the results achieved under this project, Dr. W. Burns, Agricultural Advisor and Dr. F. Ware, Animal Husbandry Advisor of the ICAR entrusted this job

to Prof. Sukhatme. It took Prof. Sukhatme about 6 months to analyze the data and evaluate the performance of the Jamuna Pari goats that were bred and brought up on the farm under the supervision of Dr. Slater. He found that milk yield indeed increased over the years. But while reporting this increase, the yield of milk from goats which were culled out was always excluded on account of their inferior performance. In reality, therefore there was no evidence that Dr. Slater had succeeded in evolving a goat with superior milk yields as claimed by him. This finding was totally unexpected. The results of the statistical study left little doubt that the stock did not have sufficient genetic variability and that in consequence no substantial progress could be achieved in improving the genetic potential of the herd for milk yield. In order to confirm this, Prof. Sukhatme further evaluated the performance of each of the several bucks used in the project and found that with the possible exception of one, none of them could be considered as proven. Based on this result he had no hesitation in concluding that after over 10 years of work, the project had failed to achieve the purpose for which it was undertaken. The impact of the appraisal on the then animal breeders in the country was profound and there was increasing recognition by them of the need for planning their breeding programmes on sound statistical principles and subsequently for carrying out appropriate statistical analysis of the data so collected. In fact, the phenomenal success of this statistical appraisal led to the expansion of the statistical unit of the ICAR into a full-fledged Statistical Wing of the Council with separate units for research on agricultural statistics and animal husbandry statistics as well as for imparting training in statistics. It finally led to the establishment of the present Indian Agricultural Statistics Research Institute (IASRI) at New Delhi.

Since then statistical analysis of data collected under the various cattle and sheep breeding projects of the Council at different farms were carried out by the Statistical Wing of the Council on a regular basis. These efforts, underscored the need for providing adequate number of breeding animals, particularly on the male side, to provide scope for efficient selection of animals with a superior genotype through properly planned progeny testing programme.

There were several other efforts made by Professor Sukhatme. A detailed investigation [6] was carried out to find the size of experiments for testing seed or vaccines. In order to assess the transmitting ability of the bull to its progeny, a sire index was developed [4]. Such an index is very useful in evaluating the breeding value and a correct estimate of breeding worth in turn helps significantly in formulating future breeding strategies for achieving genetic improvement in the herd. Sukhatme *et al* [7], also carried out statistical analysis

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of milk composition data collected by the Allahabad Agricultural Institute, which showed that a margin of tolerance has to be allowed in fixing standards of quality for milk on account of natural variation due to species and breeds of animal as well as due to seasonal and regional factors. Sukhatme *et al* [8] also applied statistical techniques for estimating nutritional requirements of cattle in metabolism studies.

3. Fundamental Quantitative Study of Inheritance using Drosophila

In the initial years of research on statistical methods in animal sciences, Prof. Sukhatme had a desire to establish a Centre to carry out research on statistical aspects of inheritance of important quantitative traits. Since such efforts with large animals were virtually impossible, laboratory animals such as fruit-flies (*Drosophila*) were to be used because of their rapidly reproducing characteristics. With Drosophila one can raise around 25 generations in a year and a lot is known about its genetics in terms of its four pairs of chromosomes. However, Prof. Sukhatme could not carry out this activity. Subsequently, at his and Dr. V.G. Panse's instance, a Drosophila laboratory was set up at Indian Veterinary Research Institute (IVRI), Izatnagar under the ICAR scheme entitled '*Fundamental Study of Quantitative Inheritance*' to conduct experiments on polygenic characters for evolving techniques for use in large animal selection studies. The statistical analysis of data so collected was undertaken by a statistician appointed in the scheme under the technical guidance of the Statistical Advisor of ICAR. This led to important studies on response to selection.

4. Creation and Strengthening of a School of Statistical Genetics at the IASRI, New Delhi

The above mentioned achievements were lateron classified under the statistical genetic analysis of breeding data at the IASRI, New Delhi. Initially the activities in this field grew very slowly but lateron for strengthening these activities a statistician of the IASRI was deputed for training on statistical methodology for genetics and breeding under the Colombo Plan to the Institute of Animal Genetics, Edinburgh under the guidance of late Prof. Alan Robertson, FRS. After his return from training, all activities in Statistical Genetics was put under his charge. Lateron a need was felt in the Fourth Five Year Plan to create posts of Senior Professor (Statistical Genetics) and Senior Statistician (Statistical Genetics). These posts were created and filled-in to guide and train students in Statistical Genetics and to do both theoretical and applied research in this field with special emphasis on animal and plant breeding. After the recognition of this Institute as a full-fledged Institute of ICAR in 1978, a

Statistical Genetics Cell was established for this work which was earlier being carried out in the Division of Statistical Research in Animal Sciences. Realizing the importance of this area of research and amount of work done in the past, it was felt by the Quinquennial Review Team (QRT) (1971-1981) that the research in the field of statistical genetics and other areas like biometry, bioassay and biostatistics may be carried out on a much larger scale. In pursuance of this recommendation a Division of Biostatistics and Statistical Genetics came into existence in 1985. With the recommendation of subsequent QRT (1987-1994), the name of this Division was changed as Division of Biometry.

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