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## Genetic Similarity and Environmental Sensitivity for Milk and Fertility Traits in Holstein-Friesian by Herd Hierarchy

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### Abstract

Population wide progeny test schemes in dairy cattle are being modified towards testing in selected contract herds. This approach is advantageous due to lower cost and ability to record many more traits because the environment is controlled. However, apart from achieving accurate differentiation of superior genotypes in superior environments, genotype by environment interaction between the selection and production environment should be considered. Milk yield and fertility traits records of 5,468 cows, daughters of 251 sires, born between 1990 and 2005 were used to analyse genetic similarity, environmental sensitivity, rank and additive genetic correlation in the Holstein-Friesian population in Kenya for 305-day milk yield, age at first calving and calving interval between the two environments. The genetic link between selection environment and production environment was 0.49. Sire rank and additive genetic correlations ranged from 0.16–0.45 and 0.15–0.46, respectively. Top ten common sires in the two environments from environment specific and joint genetic analysis were 2, 3, 1, and 4, 5, 6, respectively, for age at first calving, calving interval and 305-day milk yield. Genetic change in the production environment as a result of selection in the nucleus was 0.17 days, 0.74 days and 0.21 kg for age at first calving, calving interval and milk yield, respectively. The low genetic and sire rank correlations led to few common top ten bulls due to severe sire re-ranking across the environments. Genetic evaluation based on pooled data resulted in a higher proportion of top ten common sires that ranked highly in the selection and production environments. In developing countries where population wide recording and testing is not possible due to financial and infrastructure constraints, successful implementation of progeny testing in selected contract herds requires the breeding objective of the selection environment to be defined for the farmers in the production environment. The existence of strong genetic links between the selection and production environment can form the basis to evaluate the compatibility of the breeding objective of the selection environment with needs of farmers in the production environment.

**Keywords:** Compatibility, contract herds, correlated response, selection differential