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Is there interest in implementing genomic evaluations in a pig male line nucleus? A simulation study

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Replacing pedigree-based BLUP (pBLUP) evaluations by genomic evaluations (GE) in pig breeding schemes can result in greater accuracy and genetic gains, especially for traits with limited phenotypes, but would generate additional costs. Our goal was to determine whether any additional expenditure would be more profitably devoted to implementing GE or increasing phenotyping capacity while retaining pBLUP evaluations. A stochastic simulation was used. The study population contained 1,050 breeding females and 50 boars. It was selected for 10 years for a breeding goal including two uncorrelated traits whose heritabilities were 0.4. The reference breeding scheme was based on phenotyping 13,770 candidates for trait 1 and 270 relatives from 10% of the litters for trait 2 per year, and selection was based on pBLUP estimated breeding values (EBV). Increased expenditure was allocated to either increasing the phenotyping capacity for trait 2 while maintaining pBLUP evaluations, or implementing genomic selection. The genomic scheme was based on two training populations: one for trait 2 made up of relatives whose number increased from 1000 to 3,430 over time, and the second for trait 1 made up of candidates. Several genomic scenarios were tested, where the size of the training population for trait 1 and the proportion of genotyped candidates pre-selected based on their parental EBV, varied. Both approaches resulted in higher genetic trends and lower inbreeding rates compared to the reference scheme. However, even a very marked increase in phenotyping capacity for trait 2 could not match the improvements achieved by genomic selection when the number of genotyped candidates was large. Genotyping a limited number of pre-selected candidates significantly reduced the extra costs while preserving most of the benefits relative to genetic trends and inbreeding. Implementing GE was the most efficient approach when major expenditure was possible, while increasing the phenotypes was preferable under limited resources.