**Genomic selection for a sustainable future in dairy farming**

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As global agriculture pivots towards sustainability, the convergence of genomic selection and innovative phenotyping technologies emerges as a potent force for shaping the next generation of breeding values. This approach allows farmers, with no additional cost or effort, to actively breed for sustainability, thereby reducing their environmental footprint. Dairy breeding programs have curtailed methane emissions per litre of milk produced over the years by selecting for milk production traits, laying a foundation for a more sustainable future. However, there is pressure to further reduce emissions from the dairy sector. The release of the Sustainability Index in Australia, encompassing feed efficiency, longevity, profitability, and sustainability, is projected to lead to a 5% reduction in emissions by 2050. Yet, to achieve more ambitious global emission targets, the development of breeding values using individual methane records becomes paramount, potentially reducing emissions by 20-30% by 2050. Genomic selection has enabled the Australian dairy industry to use precision phenotyping in smaller genotyped populations to develop recent breeding values. However, genomic selection remains a “numbers game” requiring large reference populations with high-quality phenotypes to deliver reliable breeding values for farmers to make informed decisions for selective breeding. Therefore, deploying a multitude of predictors enhances methane phenotyping, with wearable low-cost sensors, mid-infrared spectroscopy from routine milk recording, and assessments of rumen microbiome and metabolites/fatty acids serving as illustrative examples. Integrating artificial intelligence into genomic selection to provide better decision-making tools is another emerging area. Navigating the challenges of measurement in commercial herds promises not only economic sustainability and license to operate, but a substantive contribution to global sustainability goals.