

Stakeholder Role Differences in the Use of Precision Livestock Farming Technologies in Europe

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This study aimed to examine whether and how stakeholder roles shape the adoption, configuration, and governance perceptions of precision livestock farming (PLF) technologies in Europe. Specifically, we investigated role-based differences in technology types, monitored indicators, usage priorities, and data governance perceptions to better understand structural alignment within emerging PLF systems.

Precision livestock farming (PLF) technologies are increasingly understood not as isolated farm tools but as components of broader digital infrastructures and multi-actor socio-technical systems. In such systems, stakeholders occupy different structural positions that may shape technology configuration and data governance. Within the Horizon Europe project Digi4Live, we surveyed 92 stakeholders (farmers 33.7%; non-farmers 66.3%) across EU member states to examine role-based differences in current PLF deployment. Technology type differed significantly by role ($p < 0.001$), with on-animal sensors dominating overall and reported almost exclusively by farmers, whereas non-farmers described more diversified portfolios including off-animal and integrated systems. Technology type was also associated with species ($p = 0.02$), with on-animal and integrated systems aligned with cattle production and off-animal systems more prevalent in pig production. Usage patterns showed both convergence and differentiation: activity and motion were the most frequently reported indicators across roles, while first ranked primary objectives differed ($p = 0.01$), with farmers prioritising reproduction management and non-farmers prioritising health monitoring. Despite these differences in system configuration and intended use, performance evaluations were broadly consistent. Data accuracy satisfaction ($M = 3.75 \pm 0.87$), overall perceived effectiveness ($M = 3.60 \pm 1.05$) and validation realism ($M = 3.61 \pm 0.91$) were significantly rated above neutral (all $p < 0.001$) with no role differences (all $p > 0.05$), indicating shared confidence in technical performance. By contrast, divergence emerged in governance perceptions: farmers more often reported uncertainty about validation procedures ($p < 0.001$) and indicated no barriers to data sharing ($p = 0.03$), whereas non-farmers more frequently cited formal validation routes and identified privacy and ownership as constraints. Although respondents perceived a positive ROI overall ($M = 3.96 \pm 0.82$, $p < 0.001$; no role difference, $p = 0.8$), high cost remained the leading concern for wider adoption. Overall, while monitoring architectures and priorities vary by stakeholder role, confidence in technical performance is shared, and differences emerge primarily in governance transparency. **Keywords:** Precision Livestock Farming, Multi-actor, Technology configuration, Data governance