

APPLICATION OF PRECISION LIVESTOCK FARMING (PLF) IN ASSESSING ANIMAL WELFARE

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ABSTRACT

Meeting the growing demand for animal products, projected to rise by 70%, while ensuring environmental sustainability and human health is a major challenge. Precision Livestock Farming (PLF) technologies provide innovative solutions through continuous, automated monitoring of animal health and welfare, addressing the challenges of managing larger herds with fewer farmers. This paper highlights the potential of PLF to enhance animal welfare by facilitating efficient, real-time assessments and addressing affective experiences such as pain, illness, and injury, thereby transforming livestock management on commercial farms.

Keywords: Precision Livestock Farming, animal welfare, sensors, behaviour

I. INTRODUCTION

The ability to feed our expanding population which is predicted to reach around 9.7 billion people by 2050 while reducing environmental effects and maintaining human health is one of the largest issues our society is currently facing (FAO, 2018). It is anticipated that by 2050, the demand for animal products (meat, eggs, and milk) will have increased by up to 70% globally. While the number of farmers is declining, this increase in production could be the result of both better productivity and an increase in the number of animals. With such large herds, it is now impossible for farmers to reliably track every animal. Technologies such as Precision Livestock Farming (PLF) are being developed to monitor the health and welfare of animals in order to address this difficulty. In order to address this difficulty, technologies such as Precision Livestock Farming (PLF) are being developed to continuously and automatically monitor animal health and welfare parameters. PLF

seeks to provide farmers with a real-time monitoring and management system, and these technologies can truly solve the problem of animal welfare. The paper aims to highlight the role of PLF technologies in order to better understand how they can contribute to the concept of welfare for animals.

II. ANIMAL WELFARE

These three aspects of animal welfare can be assessed using indicators that are mostly dependent on the animal, however the environment may also provide valuable information. Welfare is seen as a fundamental component of the food quality idea, and many customers today believe that animal-friendly products are safer, tastier, healthier, genuine, eco-friendly, and traditional. Additional profit and potentially a larger market share can be achieved by using related labelling and certification schemes to better signal to customers that the dairy products come from enhanced welfare conditions (Schillings et al.,

2021). The fact that younger customers are more willing to pay for welfare-friendly products is crucial because they will be the primary consumers of food in the future (Alonso et al., 2020). Regardless of the size of the herd, the farmer can use PLF to monitor the animals' daily activities; as a result, the use of these systems may enhance the health and welfare of the animals (Norton et al., 2019).

III. PLF IN ADDRESSING ANIMAL WELFARE ISSUES

PLF will become the "friend of animals and the panacea of farmers," not just "the engineers' daydream" (Banhazi et al., 2012). According to Tullo et al. (2017), PLF is the automatic monitoring, modelling, and management of animal production through the application of process techniques of engineering to livestock farming. PLF has the potential to be one of the most powerful innovations among several intriguing new and emerging technologies that could completely transform the livestock farming industry. Implementing PLF or Smart Farming correctly could enhance farm animal wellbeing or at the very least objectively record it (Banhazi et al., 2012). PLF technologies are made to help farmers manage their livestock by continuously, automatically, and in real-time monitoring and controlling factors related to animal productivity, environmental effects, and health and welfare (Berckmans, 2014). PLF can add value for the welfare assessment of animals by:

- ❖ Allowing individual or sub-group tracking
- ❖ Avoiding stressful procedures involving an animal handling during assessment (e.g., by body weight measurements using video cameras instead of manual weighing)
- ❖ Allowing real-time monitoring.
- ❖ By implementing early-warning signals of suboptimal status of the animals, to prevent welfare problems (Jääskeläinen et al., 2014)

IV. TECHNOLOGIES USED IN PLF FOR ANIMAL WELFARE ASSESSMENT

- Animal welfare on commercial farms is significantly and positively impacted by PLF (Tuytens et al., 2022).
- Early detection of illness or injury: For instance, the early identification of coughing may signal the development of respiratory conditions that, with proper treatment, may be able to avoid the experience of breathlessness (Beausoleil and Mellor, 2015). Similarly, monitoring foot health or tail biting may help reduce unpleasant situations if the right management choices are made.
- Monitoring natural behaviours and detecting deviations: The primary function of PLF systems is to monitor the behaviours of the animals (e.g., feeding, drinking, lying, etc.) and behavioural changes brought on by outside variables like housing conditions (e.g., temperature and humidity variations and air flow) or biological changes (e.g., oestrus, calving, and diseases) that have a significant impact on the animals' welfare and health (Caja et al., 2020). The farmer can act right away when the system sends out a warning signal (Kruege et al., 2020).
- Monitoring comfort during milking: With the introduction of automatic milking robots, PLF systems have transformed the milking process, resulting in higher milk quality and quantity while maintaining high welfare status (John et al., 2016) because each individual animal can select their preferred milking time (Kuipers et al., 1996).
- Maintaining optimal reproductive health: While mostly helpful for productivity, automatic detection of oestrus or biological changes (such as oestrus, calving, and illnesses) may lessen the requirement for stressful handling (such as in pigs), hence potentially addressing negative affective states such as anxiety or fearfulness.
- The most popular PLF application for sheep and goats is the installation of

sensors in the milking parlour. A number of PLF technologies have been developed for the monitoring and early detection of such issues (Mottram et al., 2016), including injectable devices, ear tags, rumen boluses, pedometers, collars, sensors, and infrared cameras. Five different kinds of sensors—cameras, accelerometers, photoelectric sensors, thermal cameras, and RFID are employed to detect activity in order to evaluate behaviour. RFID (feeders and drinkers), cameras, accelerometers, thermal cameras, and microphones are used to track feeding and drinking habits and evaluate health-related characteristics.

Infrared thermometers, thermal cameras, microphones, cameras, accelerometers, RFID, and water flow meters are also used.

V. CONCLUSION

Continuous welfare assessments are made more practicable by Precision Livestock Farming (PLF), which can provide pertinent information about animal welfare more quickly and easily. The wellbeing of animals on commercial farms is much improved by PLF, and the technologies could help address animal affective experiences such as pain, weakness or sickness emanating from diseases or physical injuries.

VI. REFERENCES

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