

PhD School on Agriculture, Environment and Bioenergy

(http://sites.unimi.it/dottorato_aab/)

(XXXIV cycle, 2018-20)

Project draft

1.Field of interest

AGR/19

2.Project title

Precision livestock farming: innovation to improve health, welfare and performances in dairy cattle

3.Tutor (membro del Collegio dei Docenti) Prof. Anna Sandrucci

4.Relevance of the topic and state of the art:

Lombardy is one of the most important Italian regions for dairy productions; it produces approximately 41% of Italian cow milk (CLAL, 2018). The Lombardy dairy sector will be competitive in the international dairy market if they will be able to achieve high standards of efficiency and quality in the various stages of the production process. One factor that can significantly limit the efficiency of the production process at farm level is represented by animal welfare that is related to the state of health of the animals and influences the quantity and quality of their productions. Conditions of poor welfare can, in fact, result in an increase in pathological situations and a decrease in the productive and reproductive performances of cows. Conversely high levels of production are often associated with greater risks of diseases or stress; in fact, the genetic selection for the increase in production can alter the ability of the animal to adapt to the environment and favor pathologies of various kinds such as ketosis, mastitis, ovarian cysts, lameness (Oltenacu and Broom, 2010). Furthermore, high-production cows are particularly sensitive to high temperature and humidity conditions mainly due to the intense production of metabolic heat (Berman, 2005). Housing, facilities and management methods have a considerable influence on the welfare and health conditions of the cows (Algers et al., 2009). As highlighted by Abeni and Bertoni (2009), characteristics, hygiene level and management of the rest area and litter, the availability of food and water, the microclimatic conditions and the animal density are factors that significantly influence the welfare and health of the cows, especially in intensive farms. In relation to the problem of heat stress in particular, it must also be considered that climate changes require adaptations of the structures and management of dairy farming to ensure an adequate level of animal welfare (Gauly et al., 2013). Heat stress in the dairy cows leads to a reduction in production and fertility with consequences on farm profitability but also on environmental sustainability. Effective tools to cope with these challenges have been provided by Precision Livestock Farming which is nowadays increasingly applied through the control of quali-quantitative parameters of production, behavior, and animal welfare, including real-time control of individual animal positions.

The project aims to study the relationship among housing facilities and management, environmental parameters, cow welfare, health and productive/reproductive performances in order to provide integrated solutions for real-time support in dairy farming optimization. Moreover the environmental sustainability of the solutions will be evaluated through Life

5. Layout of the project (draft)

The collected data will be used to develop a model for assessing the risk of reduced productivity in relation to the conditions of the animals and their environment. Data on the effect of heat stress measured within the 4 selected herds, will be used to determine the economic cost and the environmental impact for every degree or each point of thermal heat index above the optimum.

Activities	1 st year				2 nd year				3 rd year			
	1	2	3	4	1	2	3	4	1	2	3	4
Literature review												
Identification of farms												
Monitoring period												
Data analysis												

6. Available funds (source and amount)

META - PSR Regione Lombardia OP. 1.2.01, P.I. A.Sandrucci, contributo UNIMI: € 137515,84

FORAGE4CLIMATE - LIFE15CCM/IT, P.I. UNIMI A.Sandrucci, contributo UNIMI: € 326712,00

6. Literature:

- Abeni, F., Bertoni, G. (2009). Main causes of poor welfare in intensively reared dairy cows. Italian Journal of Animal Science, 8 (suppl1), 45-66.
- Algers, B., Bertoni, G., Broom, D., Hartung, J., Lidfors, L., Metz, J., Rushen, J. (2009). Scientific report on the effects of farming systems on dairy cow welfare and disease1: Report of the Panel on Animal Health and Welfare (Question No EFSA-Q-2006-113).
- CLAL (2018) – www.clal.it
- Gauly, M., Bollwein, H., Breves, G., Brügemann, K., Dänicke, S., Daş, G. Lohölter, M. (2013). Future consequences and challenges for dairy cow production systems arising from climate change in Central Europe—a review. Animal, 7(05), 843-859.
- Oltenacu, P. A., Broom, D. M. (2010). The impact of genetic selection for increased milk yield on the welfare of dairy cows. Animal welfare, 19(1), 39-49.

