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*Editorial*

# Innovative Technologies for the Feeding of Dairy Cattle to Ensure Animal Welfare and Production Quality—INNOVALAT

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Modern agriculture is an extremely energy-intensive process. However, high agricultural productivities and the growth of green revolution has been possible only by large amount of energy inputs and quality aspects [1–6].

Papers submitted and published in this Special Issue "Innovative Technologies for the Feeding of Dairy Cattle to Ensure Animal Welfare and Production Quality—INNOVALAT" bring together some of the latest research results in the field of welfare in the animal science sector.

Responses to our call generated the following statistics:

- Submissions (13);
- Publications (6);
- Rejections (7);
- Article types: research articles (5), review (1). Published submissions are related to six published articles. We found the editing and selection of papers for this exercise inspiring and rewarding. We also thank the editorial staff and reviewers for their efforts and help during the process. For better comprehension, the contributions to this Special Issue are split in parts, as follows.

The first contribution is entitled: Automatic Milking Systems in the Production of Parmigiano Reggiano Cheese: Effects on the Milk Quality and on Cheese Characteristics by Piero Franceschi, Massimo Malacarne, Elena Bortolazzo, Fabio Coloretti, Paolo Formaggioni, Anna Garavaldi, Valeria Musi and Andrea Summer [5]. This section studies the adoption of innovative processes, such as the automatic milking system (AMS), in the production of typical PDO cheeses, such as Parmigiano Reggiano, and how they need to be evaluated and tested to verify their influence on milk quality and the typicality of the product. The present research was aimed to study the effect of the introduction of the AMS on the cheesemaking characteristics of the milk and the ripening process and the sensory properties of Parmigiano Reggiano PDO cheese. Six cheesemaking trials were performed and, in each trial, two different separated pools of milk were submitted to the cheesemaking process in parallel, one from AMS and the other from a traditional milking parlor (TMP). AMS milk, in comparison with TMP milk, showed higher content of lactose and calcium and lower contents of somatic cells, thermophilic lactic acid bacteria, and chloride. Nevertheless, these changes were too small to influence the efficiency of the cheesemaking process and the cheese composition and its sensory profile. Moreover, cheeses made with AMS milk fully complied with the sensory characteristics of Parmigiano Reggiano cheese PDO, as defined by the PDO rules.

The second paper is entitled: "Effect of Different Rearing during the Milk-Feeding Period on Growth of Dairy Calves" by Jan Broucek, Michal Uhrincat, Peter Kisac and Anton Hanus [7]. The objective was to determine the impact of calves' rearing, gender, and the

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**Citation:** Colantoni, A.; Lacetera, N.; Basiricò, L.; Malacarne, M.; Summer, A.; Bernabucci, U. Innovative Technologies for the Feeding of Dairy Cattle to Ensure Animal Welfare and Production Quality—INNOVALAT. *Agriculture* **2022**, *12*, 631. https://doi.org/10.3390/agriculture12050631

Received: 26 April 2022
Accepted: 27 April 2022
Published: 28 April 2022

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sire lineage on the growth and health. One hundred-and-five Holstein calves were assigned to one of three treatments: single suckling (SS), multiple suckling (MS), and artificially rearing in hutches (H). All calves received a comparable amount of milk/milk replacer (MR) across treatments. All calves were weaned at the 84th day. After weaning, all calves were separated by sex in age-balanced groups. At weaning, the highest body weight was in MS and the lowest in H (SS 94.97 kg, MS 109.85 kg, H 80.80 kg, $p < 0.001$). The average gains from the birth to weaning were 0.67 kg (SS), 0.81 kg (MS), and 0.48 kg (H) ($p < 0.001$). A difference ($p < 0.01$) was found for the period from birth to 180th day of life (SS 0.75 kg, MS 0.82 kg, H 0.67 kg). We did not notice any gender differences ($p > 0.05$). The Sire 1 progeny showed a lower body weight at 180 days ($p < 0.01$) and 360 days ($p < 0.05$). The results indicate that the method used to rear calves and sire lines had a significant impact on their later performance.

The third paper has the title: Effects of Using an Alternative Bedding Composition on the Levels of Indicator Microorganisms and Mammary Health in Dairy Farm Conditions by FrantišekZigo, Nad' Sasáková, Gabriela Gregová, Jana Výrostková and Silvia Ondrašovičová [8]. In this paper, the authors compare an improved bedding composition with conventional straw bedding under farm conditions, regarding its effects on the influence of indicator microorganisms on the hygiene levels of cubicle floors and the occurrence of mastitis in dairy cows. Dairy cows were housed in newly built stalls divided into two parts, each with four subsections, and bedded cubicles arranged in three rows. Five stall subsections from each nine-bedded cubicle were selected for study, and 30 dairy cows were monitored according to the time intervals of bedding treatment for cubicles. In the first subsection (control), the cows were housed in bedded cubicles layered with straw up to a height of 20 cm. Sections 2–5 had alternative bedding (AB) as follows: fresh AB, AB 1 month old, AB 2 months old, and AB 3 months old, which were bedded one day before (fresh) and 1–3 months before the actual observation period, respectively. The alternative bedding per one cubicle consisted of ground limestone (100 kg), water (80 L), recycled manure solids (RMS; 15 kg), and straw (25 kg). After laying, the bedding was treated with a concrete selector to provide strength and sufficient resistance. A total of 180 bedding, and 600 quarter milk samples were taken simultaneously from all five monitored subsections for microbiological determination. Comparing classical straw bedding with the alternate bedding showed a stabilizing effect by keeping the bedding thickness up to the floor barrier level, which had a beneficial effect by reducing the level of fecal contamination in the rear of the cubicle. Fecal coliforms and fecal streptococci were found to be reduced in one-day-old bedding as well as after the first, second, and third months. By evaluating the health status of the mammary glands, a positive effect was noted in reducing the occurrence of subclinical mastitis, which was reflected in a reduced number of infected quarters in the group of cows housed in cubicles for three months after use of improved bedding.

The fourth article is entitled: "Detecting Heat Stress in Dairy Cattle Using Neck-Mounted Activity Collars" by Christopher Davison, Craig Michie, Andrew Hamilton, Christos Tachtatzis, Ivan Andonovic and Michael Gilroy [9]. In this paper, collar-based activity sensors are in common use as a means of detecting oestrus to optimize farm fertility and hence productivity. Recently, the same acceleration-derived signals have been processed to detect the time spent ruminating and eating, which, together, give an insight into animal welfare. Here, the use of neck-mounted accelerometers to provide a quantifiable measure of the time period that an individual animal exhibits signs of heat stress is reported. Heat stress has a significant impact on both animal welfare and productivity. Cattle studied during elevated temperatures were found to exhibit signs of exaggerated breathing motions, an indicator of heat stress, for 8 h on average per day, exceeding the time that cattle spend feeding and is similar to daily rumination times. No similar cases were recorded in the cooler conditions of a Scottish winter. The approach offers a cost-effective measure of heat stress and a potential tool to quantify its impact more generally.

The last research article is: "Towards Intensive Co-operated Agribusiness: A Gender-Based Comparative Borich Needs Assessment Model Analysis of Beef Cattle Farmers

in Eswatini" by Sicelo Ignatius Dlamini and Wen-Chi Huang [10]. In particular, beef cattle farming assumes a pivotal role in economic growth, household food security, and poverty alleviation in Eswatini. However, a paucity of information dissemination and competence are drawbacks that accord a steady annual increase in beef imports and a decline in exports. Therefore, the study conducted a gender-based comparative assessment of training needs for beef cattle farmers. Primary data were collected through personal interviews, guided by a reliability-tested questionnaire, from a sample of 397 farmers. The Borich Needs Assessment Model was adopted for data analysis and inferential statistics were employed to evaluate statistically significant differences between the gender groups. On a scale of 5, farmers were found to be less proficient (M = 1.891, SD = 0.529) in cattle production and agribusiness management practices. Female farmers were significantly less proficient than males (t = −6.004, $p$ = 0.000). Statistically significant differences in mean weighted discrepancy scores (t = 5.280, $p$ = 0.000) revealed a strong training need for females compared to men. It is recommended that dissemination of training information should be prioritized as follows: (1) agribusiness management concepts, (2) feed and feeding concepts, (3) cattle health concepts, (4) farmer–organizational concepts, (5) farm structures, and (6) breeding and rearing concepts.

In addition to the original articles, one review was published in this Special Issue, the title of which is: "An Overview on the Use of Near Infrared Spectroscopy (NIRS) on Farms for the Management of Dairy Cows" by Chiara Evangelista, Loredana Basiricò, and Umberto Bernabucci [11].

The review spoke of how dairy farming is increasingly affected by the digital revolution. To respond to current challenges—such as environmental, economic, and social sustainability—new technologies must be adopted, entering the perspective of precision livestock farming. This is made possible by the development of countless sensors to be adopted in barns. The technology that most affects various aspects of dairy cattle breeding is certainly near infrared spectroscopy (NIRS), which is versatile and can be used on-line/inline to evaluate and control the critical points of the production process by entering the PAT (process analytical technology). In barns, NIRS currently can obtain information on the chemical–physical composition of raw materials, total mixed ration (TMR), feces and digestibility, and chemical and technological analysis of milk. All this in a short time by eliminating the waiting times for analysis response and costs, allowing an improvement in livestock management. Many studies affirm the validity of NIRS as a reliable and predictive technology against multiple relevant parameters in matrices such as raw feed, TMR, feces, and milk. This review highlights the usefulness of NIRS technology in dairy farm with particular attention to portable instrumentation usable directly on the farm.

In summary, the papers of the Special Issue represent some of the latest and most promising research results in this new and exciting field, which continues to make significant impact on real-world applications. We are confident that this Special Issue will stimulate further research in this area.

In particular the number of foreign authors is very high; we can see the following affiliation:

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We thank all the authors for their contributions to this Special Issue.

**Author Contributions:** Conceptualization, L.B., A.C. and N.L.; methodology, U.B., M.M. and A.S.; validation, A.C., L.B. and U.B.; projection, A.S. and M.M.; investigation, A.C., U.B., M.M., L.B. and A.S.; data curation, A.C.; writing, A.C., L.B., A.S., M.M. and U.B.; writing—review and editing, A.C. and U.B.; visualization, A.S. and M.M.; supervision, U.B. and A.C.; project administration, U.B.; funding acquisition, U.B. All authors have read and agreed to the published version of the manuscript.

**Funding:** This work was funded by Ministero delle politiche agricole alimentari e forestali (MiPAAF; Project INNOVALAT, D.M. n. 27443, 25/09/2018).

**Acknowledgments:** This study was supported by MIUR (Minister for education, University and Research, Law232/2016, Department of excellence).

**Conflicts of Interest:** The authors declare no conflict of interest.

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