Research Group of Industrial Microbiology and Food Biotechnology (IMDO), Faculty of Sciences and Bioengineering Sciences, Vrije Universiteit Brussel, Brussels, Belgium
Contact frederic.leroy@vub.be

Animal source foods are evolutionary foods that have shaped human physiology and metabolism. Their consumption in substantial amounts goes back at least 2 million years with the emergence of the genus Homo and the appearance of tools and carnivory in the archeological record. Even if the human diet is an evolving concept rather than a static one, and should be considered as such by policy makers, animal source foods still provide key nutrients in contemporary diets that are less easily obtained from plants. This not only relates to the intake of high-quality protein but, even more importantly so, also to the role of some already limiting minerals (e.g. iron, zinc, calcium, and iodine) and vitamins (e.g. B12, A, and D), and various other nutrients of concern (e.g. DHA and choline). Despite controversies, which are driven by social anxieties, vested interests, and/or ideologies, it is argued that there is no good reason to eliminate the consumption of animal-source foods from a human health perspective, well on the contrary. People who nonetheless decide to do so on ethical or environmental grounds should keep in mind that the robustness of restrictive diets depends on knowledge, resources, and careful supplementation. Although current omnivore diets are often not well-formulated either, discouraging the consumption of some of the most nutrient-rich and species-adapted foods would constitute an additional barrier to achieving adequate essential nutrition in an already problematic foodscape. Such intervention risks causing damage in the more vulnerable parts of the population, in particular among the young, elderly, and metabolically challenged. Whereas planetary challenges indeed require urgent dietary transformation, both for reasons of human health and the environment, nutritional needs and food security should always be at the heart of decision making. This is also valid within the broader sustainability debate, where environmental impact should never be uncoupled from food security and other ways through which animal source foods contribute to the food system and societal wellbeing. Doing otherwise would result in harmful reductionism, not in the least because animal source foods and livestock farming are intimately intertwined with crop agriculture, the valorization of marginal lands and waste, the provision of ecosystem services and non-edible products (e.g. clothing and manure), food culture and heritage, regional identities, and livelihoods.

IS009

Harnessing the power of computer vision system to improve management decisions in livestock operations

Joao R.R. Dorea[a,b], Tiago Bresolin[b], Dario B. Oliveira[b], Rafael E.P. Ferreira[b]

[a]Department of Animal and Dairy Sciences, University of Wisconsin-Madison, USA
[b]Department of Biological Systems Engineering, University of Wisconsin-Madison, USA
Contact joao.dorea@wisc.edu

In livestock operations, systematically monitoring the animal body weight, biometric body measurements, animal behavior, feed bunk, and other difficult-to-measure phenotypes is manually unfeasible due to labor, costs, and animal stress. Applications of computer vision are growing in importance in livestock systems due to their ability to generate real-time, non-invasive, and accurate animal-level information. However, the development of a computer vision system requires sophisticated statistical and computational approaches for efficient data management and appropriate data mining, as it involves massive datasets. In this talk, we will discuss some of the challenges, applications, and potentials of computer vision systems in livestock operations and some examples to be presented include (1) monitoring animal growth and behavior; (2) automated feed bunk management; (3) body tissue mobilization in dairy cows; and (4) individual animal recognition. The development of computer vision technologies will potentially have a major impact in the livestock industry by predicting real-time and accurate phenotypes, which in the future could be used to improve farm management decisions, breeding programs, and to build optimal data-driven interventions.

IS010

Best practices for targeted policies to enhance ecosystem services in European livestock agroecosystems

Daniel Martín-Collado[a,b], Alicia Tenza-Peral[a,b], Alberto Bernués[a,b]

[a]Unidad de Producción y Sanidad Animal, Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Zaragoza, Spain
[b]Instituto Agroalimentario de Aragón, IA2 (CITA-Universidad de Zaragoza), Zaragoza, Spain
Contact dmartin@cita-aragon.es

Agri-environmental policies in European livestock agroecosystems are failing to address ongoing landscape change, biodiversity decline, and societal demands for sustainability due to the lack of clear and objective targets. In this context, payments for ecosystem services (PES) arises as a promising instrument to reconcile agriculture development and nature conservation objectives, encouraging the maintenance and recovery of sustainable livestock farming systems. However, the value of nonmarket functions depends deeply on societal perception. How do farmers (as providers) and citizens (as main beneficiaries and consumers) value the ecosystem services delivered from livestock agroecosystems and the agricultural practices that provide them? Moreover, given the great heterogeneity of livestock agroecosystems in Europe and their traditional practices, are all ecosystem services equally important everywhere? Do common agricultural practices have the same effect on all agroecosystems?

We present the results of long-term research, based on sociocultural valuation methods, on-mountain livestock agroecosystems in the Mediterranean and Nordic regions of Europe. We used focus groups to analyze the perception of farmers and other citizens regarding the relationship between agricultural practices and the provision of key ecosystem services. We also analyzed the best agricultural practices to reach the targeted environmental outcomes under three plausible policy scenarios.

Our results highlight the intuitive recognition of the ecosystem services derived from mountain livestock agroecosystems by farmers and citizens. Farmers showed a large capacity to recognize the complexity of ecological processes in agroecosystems and identified more clearly the cause-and-effect relationship between agricultural practices and ecosystem services. On the one hand, some agricultural practices did not have the same effect on ecosystems services in different agroecosystems. This suggests the need for regionalizing research priorities and the design of agri-environmental policies. On the other hand, a number of practices were found to be relevant for ecosystem service delivery across policy scenarios and agroecosystems. Especially, grazing practices such as extending the grazing period, grazing in semi-natural habitats, grazing in abandoned areas, adapting stocking rate to the carrying capacity, and moving flocks seasonally stand out for their relevance in all policy scenarios.

IS011

Genomic tools to improve livestock

Ignacy Misztal, Daniela Lourenco

University of Georgia, Athens, USA
Contact ignacy@uga.edu

Genomic selection is now applied widely in the industry for all the major species. The number of genotyped animals exceeds 3 million for US Holsteins, is almost a million for the US Angus, and is over 100k per line in major pig and broiler companies. The initial application of genomic selection was based on SNP estimation with phenotypes or de-regressed proofs (DRP). Chips of 50k SNP seemed sufficient as higher-density chips only marginally improved predictions. The estimated breeding value was an index with parent average and correction to eliminate double counting. Use of SNP selection or weighting increased accuracy with small data sets but less or none with large data sets. Use of DRP with female information required *ad-hoc* modifications. As BLUP is biased by the genomic selection, the use of DRP under genomic selection required adjustments. Efforts to include potentially causative SNP derived from sequence analysis so far showed limited or no gain. The genomic selection was greatly simplified using single-step GBLUP (ssGBLUP) because the procedure automatically creates the index, can use any combination of male and female genotypes and accounts for preselection. ssGBLUP requires careful scaling for compatibility between pedigree and genomic relationships to avoid biases, especially under strong selection. Large data computations in ssGBLUP were solved by exploiting the limited dimensionality of SNP due to the limited effective population size. With such dimensionality ranging from 4k in chicken to about 15k in Holsteins, the inverse of GRM can be created directly (e.g. by the APY algorithm) in linear cost. Population-wide accuracy can be calculated for any model and data size by Method LR. Due to its simplicity and accuracy ssGBLUP is routinely used for genomic selection by major companies in chicken, pigs, and beef, and soon in dairy. ssGBLUP can be used to derive SNP effects for indirect prediction, and GWAS, including computations of the *p*-values. Recent work at UGA includes a comparison of BLUP and GBLUP trends to evaluate the efficiency of genomic selection, reduction of additive variance due to the intensive genomic selection, deciphering the contents of Manhattan plots into contributions from relationships and QTN, approximation of individual accuracies for arbitrarily large data sets, and efficiency of various genomic models for analyses of multibreed and crossbred data.

IS012

New challenges: global warming, welfare, resilience. How can genetics help?

Agustin Blasco

Institute for Animal Science and Technology, Universitat Politècnica de València, València, Spain
Contact ablasco@dca.upv.es

Animal production is facing new challenges. Global warming is one of the most important concerns nowadays. Livestock is responsible for around 15% of total human-induced Greenhouse gas (GHG) emissions. Most of the GHG emissions are produced by beef and dairy cattle, with significant but much lower contributions of pigs, poultry, buffalo and small ruminants. Increasing production efficiency reduces GHG emissions and other