

# Seven questions around sustainable dairy

There are a number of areas of concern when it comes to sustainable dairy; here, Christina Marantelou explores several of them alongside ways in which the sector is finding resolve.

*“Dairy processors worldwide are aware of their sector’s shortcomings regarding sustainability issues”*

**F**OOD PRODUCTION and consumption have been recognised as major sources of environmental impacts. The challenge of meeting the dietary requirements of an increasing world population is stimulating fierce debate about the sustainability of current food production systems, with particular reference to meat and dairy productions.

Dairy processors worldwide are aware of their sector’s shortcomings regarding sustainability issues. While the sector undoubtedly contributes to nutritious and healthy diets, it also impacts climate change, animal welfare, biodiversity and soil fertility.<sup>1</sup> Conventional dairy production entails processes that contribute to climate change, acidification, eutrophication, and ozone depletion,<sup>2,3</sup> and its overall carbon footprint is comparable to that of aviation and shipping combined.<sup>4,5</sup> While the search for more efficient and sustainable processes has become the cornerstone of any production system, it is ultimately an integral part of business operations too.

However, we first must answer some crucial questions: what is needed to improve sustainability in the dairy chain; which practices are available for different farm types; and how can we ensure that these practices are really implemented by farmers? Initially, we must address the seven main dairy sustainability topics.

## 1. Greenhouse gases

Dairy farms emit greenhouse gases (GHG), which have an impact on our climate. For obvious

reasons, it’s not possible to reduce a cow’s methane emissions completely, but it can be significantly reduced, for example through optimised feed composition.<sup>6</sup> The reduction of emissions on dairy farms focuses on methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), and to a lesser extent on carbon dioxide (CO<sub>2</sub>). Feeding and manure management offers opportunities for reduction. Farms can also contribute to the reduction of greenhouse gasses by taking measures that sequester carbon in soils through the increase of soil organic matter.

## 2. Soil quality and nutrients

Improving soil quality focuses on optimal crop yields combined with adding to soil ecosystem functions, such as water regulation, nutrient cycling, soil microbial and plant biodiversity. Nutrient application will be adapted to minimise



Jelle Zijlstra and Alfons Beldman, experts on sustainable dairy at Wageningen

nutrient losses like nitrogen and phosphorus to water and air. Sequestration of carbon in soils is an important measure to improve soil quality and to contribute to the reduction of GHGs in the air.

### 3. Biodiversity

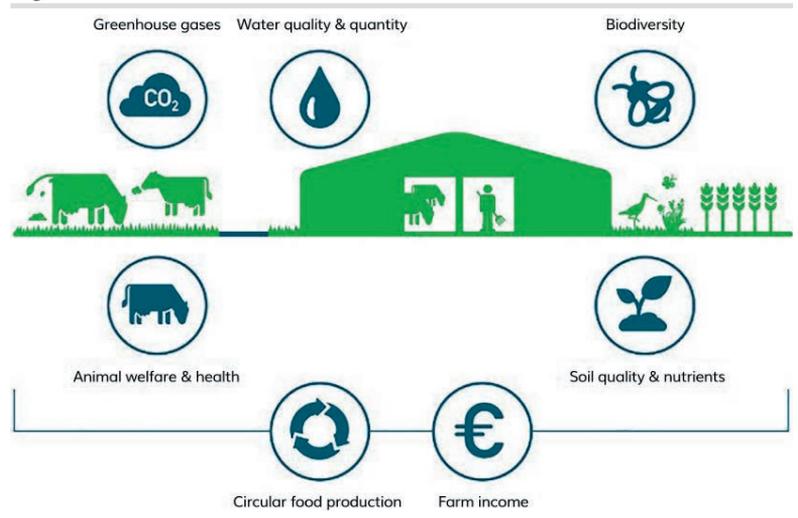
Land use for growing dairy cattle feed will impact local and global biodiversity. Developing best practices that contribute to biodiversity is an emerging topic in dairy research. Examples of these practices include the reduction of emissions that are harmful to nature, less use of biocides, and less use of soy from areas at risk of deforestation. Collaboration with nature conservation organisations, landscape restoration and protection of rare species also contribute.

### 4. Water quality and quantity

Water can have many roles on the farm, including facilitating crop growth, being used as drinking water for animals, and for cleaning. Minimising the impact of the farm on the quality of surface and ground water is the first sustainable objective. This is connected to the use of fertiliser, manure, biocides and other types of water contamination.

The second one is to use water efficiently, both for crop and milk production. A thorough report about the water footprint of dairy production in Ethiopia (2019) from Raquel de Paiva Seroa da Motta can be downloaded for free at <https://doi.org/10.18174/494591>. Another noteworthy article is 'Evaluation of Virtual Water and Water Sustainability of Dairy Production in Trentino Alto Adige (North-Eastern Italy)'.

Figure 1



The seven primary topics for sustainable dairy production. (Source: WUR)

### 5. Animal welfare and health

Creating conditions that enable normal patterns of animal behaviour by adjustments of housing and application of grazing will have a positive impact on welfare and health. The introduction of animal measurements to monitor welfare is an important field of research to better understand health and happiness. Feet and legs, mastitis and heat stress are important issues that require further improvement to increase animal welfare (Figure 1).

### 6. Circular food production

The aim of a circular food system is to optimise the use of available biomass resources in the world. »

*“Minimising the impact of the farm on the quality of surface and ground water is the first sustainable objective”*

## EXPERT VIEW



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## Making egg detection easy

Dr Richard Newton explains how to overcome the challenges of detecting egg allergens in processed food.

Allergen detection methods are an essential tool for screening ingredients, finished food products and environmental samples for the presence of allergen proteins to ensure the safety of food-allergic consumers and compliance with labelling legislation. The scope of food products is ever expanding and the challenge this array of food matrices presents to allergen analysis was recently highlighted in a 2021 FAO/WHO report on Risk Assessment of Food Allergens.

Detection of egg protein is particularly problematic as it is often found in heat-processed foods such as baked goods, pastries, noodles and pasta. The extraction procedures in most commercial

egg assays are often unable to efficiently detect egg protein from these sources. This can result in severe underestimation of egg levels present in a food or, even worse, a false-negative result. Importantly, such foods may still trigger an allergic response in egg-allergic consumers, which can have serious implications.

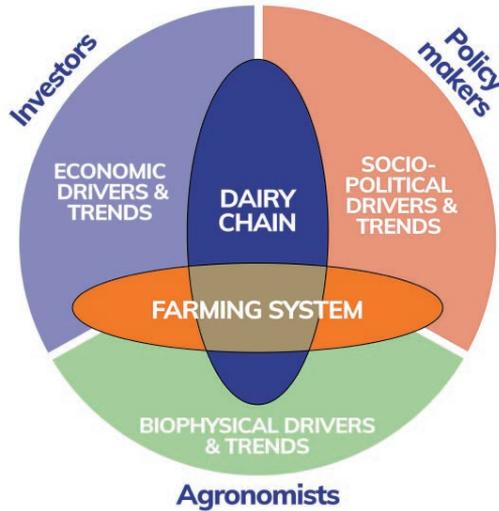
Underlying this low detection efficiency is the formation of disulphide-linked aggregates of egg-white proteins at high temperatures, which are poorly soluble and hinder binding of the detection antibodies. Measurement of egg in heat-processed samples therefore requires the use of reducing agents

and surfactants in the extraction procedure to facilitate the break down and solubilisation of these cross-linked egg proteins. The recently released ELISA Systems Processed Egg assay, ESEGPR-48, combines the use of a new extraction method with a simple test protocol to allow the rapid detection of both native and processed egg residue. The kit is not just easy to use, it also provides exemplary results for the detection of egg and is exclusive to ELISA Systems.

The new Processed Egg kit meets the challenge of providing the widest matrix applicability while still retaining assay simplicity, which provides a valuable tool for allergen management in the food industry.

Figure 2

*“The dairy sector contributes to the economic viability and resilience of many rural communities and to supplying nutritious food in many countries”*



Dairy production and marketing are operating in a dynamic context of economic, biophysical and socio-political drivers and trends. (Van der Lee, 2014)

One of the goals in this circular approach is to avoid the use of human-edible biomass (such as grains and pulses) as food source for animals. The task for the dairy sector is to reconsider the position of the dairy cow in a circular food system. Future feed rations should focus more on residuals

from plant production and by-products from the food industry. Looking further into the future, scientists are examining the use of seaweed to reduce enteric methane emissions from cattle.<sup>7</sup>

**7. Rural livelihoods**

The dairy sector contributes to the economic viability and resilience of many rural communities and to supplying nutritious food in many countries. Building stronger dairy chains that respond to market needs and secure safe and nutritious dairy foods are crucial goals in dairy development. Incorporating sustainability themes, including the optimal use of land resources, is vital to build strong international dairy chains that contribute to economic growth.

Aside from the seven above-mentioned main dairy sustainability topics, it should not be forgotten that every dairy sector is part of a broader economy and its opportunities for further development depend not only on the characteristics of the farming systems and the supply and demand for dairy products, but also on the broader context. **Figure 2** presents this broader context around the dairy sector, showing three partly overlapping factors: the economic (investors), the biophysical (agronomists) and the socio-political (policymakers). As anticipated, dedicated and decisive stakeholders represent the best chance that the dairy development plan will be translated into action.

According to experts from Wageningen University and Research, dairy farmers or processors can achieve their sustainability goals in five steps or less (**Figure 3**).

Figure 3



Infographic process. (Source: WUR)

**Consumers**

But what is the opinion and the behaviour of consumers towards sustainable dairy products, since not all innovation impacts them in the same way?

Product innovations are more easily noticed by consumers than, for example, process and system innovations, which are more difficult for the consumer to understand unless they are embedded in specific quality cues.<sup>8</sup> Also, innovation in traditional sectors like dairy farming can be a cause of cognitive dissonance, because consumers tend to reject innovations that can be perceived as altering the authenticity of traditional foods.<sup>9</sup> Studies have shown that consumers tend to accept processing-technology innovations on the condition that they do not modify the intrinsic attributes of the product.<sup>10</sup>

A recent online research study on consumer perceptions of selected innovations in organic and low-input dairy systems gathered data from six countries (Austria, Belgium, Denmark, Finland, Italy and the UK). The selected

innovations were the three following novel sustainable production strategies: agroforestry, prolonged maternal feeding of young cattle, and alternative protein sources. The data showed that prolonged maternal feeding is the novel production practice that has the highest level of acceptance by consumers in all of these countries, with the least accepted practice being alternative protein sources.

Unexpectedly, increased availability of home-grown feed, which is grounded on

both farmer and societal interests for higher input self-sufficiency and more sustainable production practices, was not appreciated by consumers, although their intentions appear to be dependent on their moral norms. One explanation might be that the consumers perceived the innovative practice as mainly of benefit to farmers, as they might not have fully understood the importance in terms of food safety and traceability of reducing the outsourcing of protein by farmers.<sup>11</sup> 

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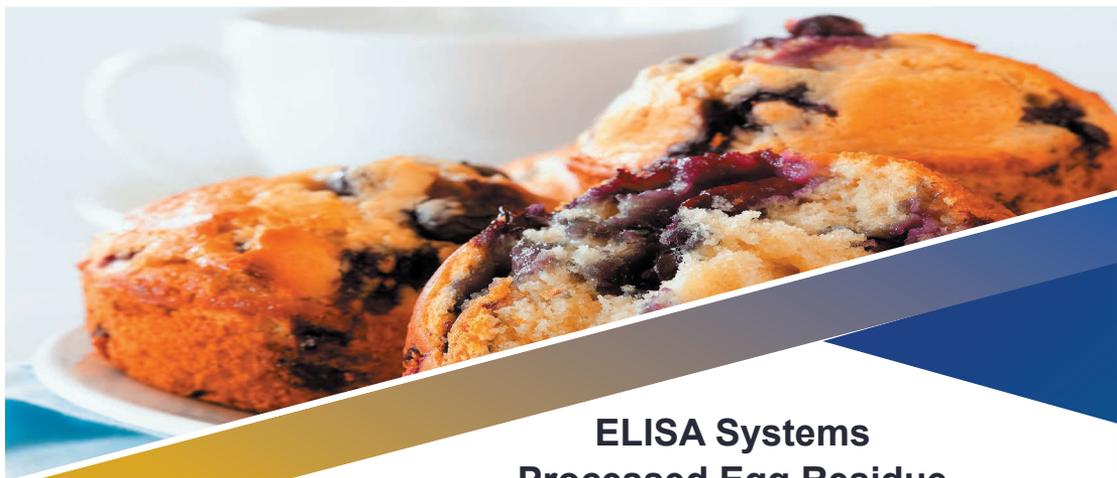


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## ELISA Systems Processed Egg Residue Detection Kit ESEGGPR-48

The accurate detection of egg protein in heat processed foods, such as bakery products or pasta has previously been challenging.

To overcome these issues ELISA Systems has developed a new Processed Egg Residue Detection Kit that incorporates a novel, straight-forward sample extraction to allow high efficiency detection of egg protein in both heat processed and non-processed foods.

Our new innovative Processed Egg Residue Detection kit is now in stock and is ready to go!