



An evaluation of four private animal health and welfare standards and associated quality assurance programmes for dairy cow production

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ABSTRACT

Private standards in animal health and welfare (AHW) and associated quality assurance (QA) programmes are an important instrument for food policy with the potential to substantially improve AHW. However, there are concerns that they do not necessarily do so. In this study, we evaluated four private AHW standards and associated QA programmes for dairy cow production, from Denmark, Ireland, the Netherlands and the United Kingdom, using an existing (but adapted) conceptual framework. The framework considers criteria relating to programme goals including relevance to AHW, programme beneficiaries, effectiveness, efficiency and transparency. The current study focused on information that was publicly available online. We found limited objective information to support programme claims, although there were considerable differences between programmes. Across all programmes, problems were identified with respect to transparency, and attempts to scrutinise claims would not be a straightforward process for most consumers. Among the programmes, there were notable examples of best-practice in AHW, relating to science-based evidence, separation of risk assessment and risk management, animal-based measures, farm benchmarking, ongoing programme-level metrics and measurement, and ongoing programme review. There is a need for careful scrutiny of private standards and QA programmes, to provide consumers with assurance with respect to programme effectiveness and transparency. Further, it is important that programme efficiencies are maximised. There is a strong case for regulatory oversight of private standards in AHW and associated QA programmes. This could be within existing or defined policy instruments, both to facilitate the positive impact of these programmes and to build confidence among consumers of the validity of programme claims.

1. Introduction

Throughout the European Union (EU), farmers are obliged to meet public standards in animal health and welfare (AHW), as outlined in EU and national legislation. In recent years, this has been supplemented with private standards in AHW, frequently as part of quality assurance (QA) programmes, which are generally aligned to socially important issues, related to the environment (for example, greenhouse gas emissions), the product (quality and safety), or the animals (health and welfare). These private AHW standards and associated QA programmes generally add criteria which go beyond the legal requirements ('above baseline') (European Commission, 2010), providing a means to

differentiate product and to increase domestic and international market access, market share and profit margins (More et al., 2017). The emergence of QA programmes has occurred coincident to an increasing concern for animal welfare among European citizens, coupled at least in part with the willingness to reward higher standards in animal welfare (European Commission, 2016; Directorate General for Parliamentary Research Services, 2021). In 2020, the Council of the EU recommended the development of an EU-wide animal welfare label, this being a harmonised label on food produced under animal welfare standards that are higher than those in EU legislation (Council of the European Union, 2020). QA programmes also offer the potential for financial benefits to farmers (financial; Main et al., 2014) and consumers (choice;

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Kehlbacher et al., 2012). Furthermore, QA programme membership may be used as a criterion for risk-based inspection, as programme membership is associated with increased compliance with national animal welfare legislation (Clark et al., 2016). As a reflection of increased retailer involvement in recent years, these standards are moving towards market-based governance in the field of farm animal welfare (Vogeler, 2019).

Private standards have great potential to improve AHW (Main et al., 2014; Lundmark et al., 2018). This is important given that there is no species-specific legislation in the EU to regulate the welfare of dairy cattle (Nalon and Stevenson, 2019; Directorate General for Parliamentary Research Services, 2021). There are particular concerns for the welfare of cows in dairy production, including those linked to the intensification of this industry and to rapid herd expansion following milk quota abolition in the EU in 2015 (Giles, 2015; Mee and Boyle, 2020). Key concerns include overcrowding during housing and breeding strategies linked with excess production pressure, production diseases and low longevity (Directorate General for Parliamentary Research Services, 2021). There is no clear picture of the welfare of dairy cows in the EU, with member states lacking national systems to collect and analyse data that would allow a robust assessment of dairy cow welfare (DG Health and Food Safety, 2017). Hence, the fact that many QA programmes simply align with (that is, do not exceed) baseline legal standards in the EU supports concerns that they do not in fact improve AHW at farm level (Annen et al., 2011; Main et al., 2014; Lundmark et al., 2018). It has also been noted that QA programmes vary greatly in terms of functioning and design (Directorate General for Parliamentary Research Services, 2021). Collectively, these concerns could explain the growing scepticism among farmers and consumers for QA programmes that include provisions for farm AHW (Purwins and Schulze-Ehlers, 2018). Barnett et al. (2016) suggested that increased market opportunities for 'animal friendly' products may jeopardise farmer credibility by creating inconsistent messages that are at odds with consumers' needs for improved traceability, the sourcing of local ingredients, and the provision of clear, correct labelling. Similarly, Bock and Buller (2013) highlighted the potential for AHW to be manipulated by the food industry for product segmentation, brand differentiation and increased prices.

2. Conceptual framework

There is a need for detailed scrutiny of private AHW standards and associated QA programmes, to provide interested parties with both confidence and transparency (More et al., 2017); that is, confidence with respect to programme benefits and prioritisation, and transparency of information to allow fair critique and comparison (Heerwagen et al., 2015). Main et al. (2014) proposed a best-practice framework for QA programmes for animal welfare, focusing on key principles of a dynamic welfare management system, progressively higher standards, targeted assessment and support, and external scrutiny and involvement. Drawing on principles that underpin public animal health standards in relevant international organisations, More et al. (2017) developed a conceptual framework to support best-practice in the design and evaluation of QA programmes. This conceptual framework was recently used as part of an ex-post evaluation of animal welfare labelling (essentially QA programmes with a focus on animal welfare) in EU member states (Directorate General for Parliamentary Research Services, 2021).

3. Study objectives

The primary objective of this study was to evaluate four private AHW standards and associated QA programmes for dairy production using this conceptual framework, thereby clarifying the primary programme goal(s) and measurable outputs relevant to AHW, and the primary programme beneficiaries, and determining whether the programme is effective, efficient and transparent (More et al., 2017). As a secondary

objective, the conceptual framework was refined, based on the experiences gained.

4. Materials and methods

4.1. The evaluation framework

The evaluation framework was previously proposed by More et al. (2017).

During the current study, this framework was adapted following detailed discussion within the research team, to improve clarity (in particular distinguishing those questions about the programme, programme elements or standards that are general in nature, and those that specifically relate to AHW) and to address issues of omission or duplication. As a consequence, four key changes were made, as follows. We now distinguish questions that relate to the programme (or standards) in general, and those that are specific to AHW. Further, we now provide definitions for each of the individual beneficiaries (society, consumers etc.); for example, the societal question now states '*Does the programme provide broader benefits to society, for example through measured/able improvement in animal welfare, environmental sustainability and/or public health including food safety (so-called public goods)?*' In the section relating to the effectiveness of standards relevant to AHW, further detail is provided to precisely determine the role of science during standard development, the separation of risk assessment (independent scientific advice) and risk management (standard development), as is now best-practice within the EU (Regulation (EC) No. 178/2002; Houghton et al., 2008), and the use of terminology (criteria, control points or protocols) to best encompass the broad scope of measures that could be relevant. Finally, under programme transparency, we combined key programme statistics under a single criterion.

There are five sections in the revised framework relating to programme goals, namely relevance to AHW, programme beneficiaries, programme effectiveness, programme efficiency and programme transparency. In each section, there are a number of sub-sections, including those focusing on the QA programme in general (and specific for governance or operation) and those focusing on aspects of either the programme or the standards that relate specifically to AHW. The framework includes a total of 32 evaluation criteria.

4.2. Data collection and validation

Four QA programmes to accredit dairy milk production were chosen for investigation in this study; namely Arla Food's Arlagården (Denmark), the FrieslandCampina Foqus planet programme (Netherlands), the Bord Bia Sustainable Dairy Assurance Scheme (SDAS, Ireland) and RSPCA Assured (UK). The programmes were chosen using non-random methods, being QA programmes in several current or former EU member states where dairy production is of national importance.

Representatives from each of the QA programmes were notified of the purpose of this study, and its linkage to earlier work (More et al., 2017). A systematic evaluation of the four QA programmes was conducted based on the 32 criteria in the revised framework. Each evaluation was limited to information that was publicly available online during October-December 2020. For those QA programmes that operate internationally, only information relevant to the country where the head office is located was considered. Where relevant, electronic documents were translated into English using Google Translate (Google, Mountain View, California, United States). On occasion, other sources of publicly available information were consulted (for example, relating to the parent organisation, specific programme components, other AHW initiatives in the country). However, this was only undertaken to better understand broad aspects of each QA programme (including background, context, drivers) and/or specific programme components. In addition, when assessing the criteria '*the role of science in the development*

of the animal health and welfare standards', a Google Scholar (Google, Mountain View, California, United States) search was conducted using relevant terms (for example, Foqus planet, KalfOK, RSPCA Assured, Welfare Outcome Assessment, Welfare Quality®) to identify related scientific publications. Throughout the review, we used the revised framework as a guide, incorporating relevant publicly available text (and the source of this text) under relevant criteria. The authors elaborated this text to create a summary statement ('*Author interpretation*') for each criterion. If no relevant information was available, the author's interpretation stated '*To our knowledge, this information is not publicly available*'.

At the end of this process, each completed framework was shared with the relevant QA programme provider for a one month period (mid-Dec 2020 to mid-Jan 2021) seeking comment with respect to error or omission, but limited to information that was publicly available at that time. Feedback was obtained from two of the four companies, and was considered in the final version of the completed framework form.

The completed frameworks for each of the four QA programmes are available as Appendices 1 to 4 (Supplementary data).

4.3. Data extraction and analysis

The completed frameworks for the four QA programmes were summarised, primarily drawing on the information relating to the 'author interpretation', into a series of Tables aligned to the different sections of the framework. This information formed the basis for discussion within the project team, with emphasis on patterns observed, similarities and differences with relevant information in the scientific literature, as well as methodological challenges and conclusions that could be drawn.

The study complied with the Human Research Ethics Committee's guidelines on 'Human Subjects Low Risk Projects' at University College Dublin and was awarded an exemption from full ethical review (LS-E-19-06 Hanlon Exemption).

5. Results

5.1. The revised framework

The revised framework is presented in [Table 1](#).

5.2. Programme description

[Table 2](#) presents background information about the four QA programmes. Foqus planet and Arlagården are managed by companies with a strong farmer cooperative tradition, whereas SDAS is a QA programme of the Irish State (Bord Bia), and RSPCA Assured is the QA programme of a charity (Royal Society for the Prevention of Cruelty to Animals).

5.3. Programme goals

The context, drivers and primary programme goals are presented in [Table 3](#). All four QA programmes operate in a commercial context, but with differing primary goals. RSPCA Assured primarily seeks to improve AHW, specifically of farm animals, whereas the primary goals of the other programmes are broader, with greater focus on milk quality and dairy industry sustainability. With Foqus planet, SDAS and Arlagården, there is some evidence of objective progress towards the primary programme goals, whereas this information is not available for RSPCA Assured.

5.4. Programme beneficiaries

The assessed beneficiaries of the four QA programmes are presented in [Table 4](#). Foqus planet and Arlagården each provide benefits to a broad range of stakeholders (society, consumers, industry, farmers, animals), with an emphasis on member farmers. The main beneficiary of the SDAS

Table 1

Revised framework for critical evaluation of private standards and associated quality assurance (QA) programmes, adapted from the conceptual framework proposed by [More et al. \(2017\)](#).

<u>a. What are the primary programme goal(s) (and associated measurable outputs), and what is the relevance to animal health and welfare?</u>
<i>The QA programme in general</i>
<ul style="list-style-type: none"> ● What is the broader context (commercial, cultural etc) in which the programme operates? What are the primary drivers for programme development/implementation? ● What is the primary goal(s) of the programme? ● Is it possible to objectively demonstrate progress towards the primary programme goal(s) (e.g. annual reporting to key performance indicators)? ● What is the relevance of the primary programme goal(s) to animal health and welfare?
<u>b. Who are the primary beneficiaries of the programme?</u>
<i>Individual beneficiaries</i>
<ul style="list-style-type: none"> ● <i>Society</i>: Does the programme provide broader benefits to society, for example through measured/able improvement in animal welfare, environmental sustainability and/or public health including food safety (so-called public goods)? ● <i>Consumers</i>: Does the programme provide direct benefits to consumers, for example measured/able improvement in product quality or other criteria that could guide consumer choice? ● <i>Industry</i>: Does the programme provide broader benefits to industry, for example through measured/able improvement in profitability, product differentiation and/or facilitated market access? ● <i>Farmers</i>: Does the programme provide direct benefits to farmers, for example through measured/able improvement in on-farm profitability? ● <i>Animals</i>: Does the programme provide direct benefits to animals, for example through measured/able improvement in animal health and welfare?
<i>Primary beneficiaries</i>
<ul style="list-style-type: none"> ● Who are the assessed primary beneficiary(ies) of the programme?
<u>c. Is the QA programme effective?</u>
<i>The standards relevant to animal health and welfare</i>
<ul style="list-style-type: none"> ● Do the standards exceed the legislative baseline ('good enough')? Do they exceed good farming practice ('better')? Can they reasonably represent 'best' practice? ● What is the role of science in the development of the animal health and welfare standards (e.g. collaboration with research institutions or expert scientists)? During standard development, is there clear separation between risk assessment (the provision of independent scientific advice, without regard to non-scientific considerations) and risk management (the development of the standards, based on scientific and non-scientific considerations)? ● Are any animal health and welfare criteria, control points or protocols used in these standards? Are animal-based measures part of the animal health and welfare criteria, control points or protocols? ● Are these standards aligned to international public animal health and welfare standards or guidelines?
<i>The QA programme relevant to animal health and welfare (performance)</i>
<ul style="list-style-type: none"> ● Is there objective evidence of ongoing improvement, with respect to programme outputs relevant to animal health and welfare? ● Are aspects of the programme relevant to animal health and welfare under ongoing review? ● What strategies (such as benchmarking or key performance indicators) are used to facilitate ongoing farm improvement in animal health and welfare?
<i>The QA programme in general (operation)</i>
<ul style="list-style-type: none"> ● How is farm compliance assessed? What auditing processes are used? ● What steps are taken to achieve consistency in compliance decision-making (ie, achieving inter-observed agreement)? ● How is farm non-compliance addressed? What sanctions are applied?
<u>d. Does the QA programme seek to maximise efficiencies?</u>
<i>The QA programme in general</i>

(continued on next page)

Table 1 (continued)

- How are the programme costs allocated?
- What are the synergies with existing (generally regulatory) on-farm auditing?
- What are the synergies with national and/or sectoral efforts towards improved animal health and welfare?
- During programme (re-)design, how does the programme link to national and/or international research efforts in animal health and welfare?

e. Is the QA programme transparent (publicly available)?

The QA programme in general (governance)

- Are the on-farm standards publicly available?
- Is there transparent reporting of programme structure and activities (including members of the governance body, meeting dates and agendas, meeting minutes)?
- What governance strategies are in place to handle potential conflicts of interest in the programme and/or the standard-setting process (e.g. Code of Conduct)?
- Is programme financial reporting publicly available?
- Is there transparent reporting of the standard-setting process?

The QA programme in general (operations)

- Is there transparent, objective, timely and ongoing reporting of key programme statistics, including annual data on the number of farms enrolled (at the start of the year [existing], during the year [new]), programme coverage (number enrolled/ number that could potentially participate), and the number of farms deemed compliant (certified) and non-compliant
- Can programme decisions be appealed? Is there transparent reporting of the appeal process? Is there transparent reporting of appeal decisions?
- Is there transparent reporting of major programme developments and changes?

is the Irish dairy industry (processors and cooperatives), with further benefits to society and farmers. The main or primary beneficiary of RSPCA Assured are farm animals with further benefits to farmers and society.

5.5. Programme effectiveness

Aspects of the effectiveness of the four QA programmes, including standard-setting, programme performance and compliance, based on an assessment of available programme information and company information, are presented in [Table 5a](#) and [Table 5b](#).

The standards used in Foqus planet, RSPCA Assured and Arlagården exceed the EU legislative baseline on AHW, whereas SDAS does not. Science plays a major role in the development of the Foqus planet and RSPCA Assured standards, and all QA programmes except SDAS utilise both resource- and animal-based measures. Only RSPCA Assured provides a clear separation between risk assessment (the provision of independent scientific advice, without regard to non-scientific considerations) and risk management (the development of the standards and QA programme, based on both scientific and non-scientific considerations) during the standard-setting process. All programmes have some level of alignment to relevant international standards.

Foqus planet provides objective evidence of ongoing improvement in AHW, both nationally and at farm level, and farm-level benchmarking is used extensively. In contrast, SDAS provides no evidence of objective improvement in AHW. Arlagården and RSPCA Assured both rely on incremental improvement in standards to support ongoing

Table 2

Background information, available publicly, about four quality assurance programmes.

	Foqus planet	Sustainable Dairy Assurance Scheme (SDAS)	Arlagården	RSPCA Assured
<i>Organisation</i>	FrieslandCampina	Bord Bia ^a	Arla	RSPCA ^b
<i>Governance</i>	The company is fully owned by Zuivelcoöperatie FrieslandCampina U.A., with more than 18,000 member dairy farmers in the Netherlands, Germany and Belgium. It is the world's largest dairy cooperative and one of the world's largest dairy companies	Bord Bia assists and develops the marketing of Irish food and livestock and operates in accordance with the provisions of the Bord Bia Acts and Amendment Acts and under the aegis of the Irish Minister for Agriculture, Food and the Marine. Over 16,000 dairy farmers are certified to SDAS representing 95% of Irish dairy production	Arla Foods is an international cooperative developed with farmer owner/members in 7 countries, with its headquarters in Denmark	RSPCA Assured farm assurance and food labelling scheme is a wholly-owned subsidiary of the Royal Society for the Prevention of Cruelty to Animals (RSPCA), an international animal welfare charity. RSPCA Assured has approximately 3,700 members
<i>Founded</i>	2008, with cooperative roots back to 1879	1994	1880	1824
<i>Legal entity</i>	Company (with a cooperative tradition)	State body	Company (with a cooperative tradition)	Charity

^a The functions of Bord Bia are to promote, assist and develop, in any manner which the Board considers necessary or desirable, the marketing of Irish food and livestock and the production, marketing and consumption of horticultural products.

^b RSPCA Assured is independent of both the food and farming industries. The standards and data collection protocols were developed in collaboration with academics from Bristol University, to support the use of valid and robust measures/indicators.

Table 3

The context, drivers and primary goals of four quality assurance programmes, based on publicly available information.

	Foqus planet	Sustainable Dairy Assurance Scheme (SDAS)	Arlagården	RSPCA Assured
<i>Context and drivers</i>	Commercial, with a strong cooperative tradition. Key drivers include food safety and quality and sustainability throughout the entire chain	Commercial, focusing on sustainability and quality assurance, providing a means for market differentiation of Irish dairy products	Commercial, developed to protect home markets and in response to demands of the global market	Commercial (not for profit), developed to provide higher standards of farm animal welfare
<i>Primary programme goals</i>	Quality and sustainability, including demonstrating that milk is safe and produced from healthy cows	To demonstrate a commitment to sustainability and adherence to quality standards	To assure milk safety, quality, sustainability and animal welfare	To improve the health and welfare of farmed animals
<i>Is it possible to objectively demonstrate progress towards the primary programme goals?</i>	Yes, including responsible use of antibiotics, cow longevity, calf health and welfare, access to pasture, and infection status	Partially (e.g. CO ₂ emissions)	Partially (e.g. CO ₂ emissions)	No evidence is available
<i>Relevance of primary programme goals to AHW</i>	AHW is a component of broader programme goals	AHW is secondary to the main programme goals	AHW is a component of broader programme goals	AHW is the primary programme goal

Table 4

The assessed beneficiaries of four quality assurance programmes, based on publicly available information.

	Foqus planet	Sustainable Dairy Assurance Scheme (SDAS)	Arlagården	RSPCA Assured
<i>Broader benefits to society (public goods)</i>	The programme addresses issues of societal concern including sustainability, food safety, AHW and access to pasture	The programme addresses issues of societal concern, including sustainability and adherence to quality standards	The programme addresses issues of societal concern including sustainability, food safety and AHW	The programme addresses societal concerns about AHW
<i>Direct benefits to consumers</i>	The programme assures that food is produced to standards of quality and safety that exceed the legislative baseline	The programme assures compliance with (minimum) legislative standards in milk quality and safety and AHW	The programme assures that food is produced to standards of quality and safety that exceed the legislative baseline	The programme assures that food is produced to standards of AHW that exceed the legislative baseline
<i>Broader benefits to industry</i>	The programme is a central contributor to the company's efforts towards maintaining and expanding market share	The programme enables product differentiation and the potential for increased access to international markets	The programme benefits industry through stable access afforded by the international scope of the company	The programme enables product differentiation and broadens the consumer base
<i>Direct benefits to farmers</i>	Farmers receive performance premia, member bonds, and a premium over baseline milk price	Farmers benefit through ongoing industry-level market access. There is the potential for improved farm financial performance through efficiency gains	Farmers benefit through improved on-farm efficiency, financial benefits (cost-savings, a premium on baseline milk price, profit sharing) and advice	Farmers can command higher prices through direct sale to large retailers/wholesalers and access advice (e.g. welfare outcome assessment reports)
<i>Direct benefits to animals</i>	Animals benefit substantially, with a focus on cow longevity, cow welfare, calf health and welfare, access to pasture and additional indicators	No information is available demonstrating measured improvement in AHW	Animals should benefit through herd health planning, protocols for lameness and mastitis, and routine data recording	Animals benefit substantially, with a focus on improved management, housing and husbandry conditions from birth to slaughter
<i>Assessed primary programme beneficiary</i>	Member farmers, in particular	Primarily the dairy industry (processors & co-operatives)	The member dairy farmers/the company, in particular	Member farmers and farm animals, in particular

improvement.

SDAS, Arlagården and RSPCA Assured provide detailed information about farm compliance, and all four programmes have an auditing process in place and policy to address non-compliance.

5.6. Programme efficiency

Information about cost allocation is only available for RSPCA Assured, where member farmers are charged an annual fee (Table 6). Arlagården coordinates on-farm auditing with other routinely collected data. All programmes have links with national and/or sectoral efforts towards improved AHW, with Foqus planet providing detailed information of a broad range of synergies including sustainable antibiotic usage, cow welfare, calf health and welfare, and infectious disease control. All of the programmes highlight linkages with national AHW research.

5.7. Programme transparency

Detailed on-farm standards are available for all programmes except Foqus planet (Table 7). Foqus planet, SDAS and Arlagården provide detailed information about corporate governance and finances of their respective parent organisations (FrieslandCampina, Bord Bia and Arla), but not about the specific QA programmes. Foqus planet and SDAS provide details of the management of conflicts of interest. RSPCA Assured provides comprehensive information of the standard-setting process, whereas this information is not available for the other programmes.

Foqus planet is a mandatory programme for all farmers who deliver milk to FrieslandCampina. None of the programmes present detailed programme statistics, such as the number of farms enrolled, programme coverage and the number of farms deemed non-compliant, although some basic information is available for Arlagården and RSPCA Assured. SDAS provides detailed information about the appeals process, however, there is no information on appeal decisions for any programme. All programmes report major programme developments and changes.

6. Discussion

Private standards and QA programmes have the potential to substantially influence food quality and consumer behaviour, with important implications for food policy. In earlier work, More et al. (2017) argued for greater scrutiny of private standards and associated QA programmes, and presented a conceptual framework to facilitate objective evaluation. The results from the current study, which is based on the application of this framework following adaptation, highlight strengths and weaknesses in the four QA programmes. Certainly, there are concerns across all programmes, but also a number of examples of best-practice, which collectively have the potential to substantially improve AHW at national scales. With several programmes, claims are supported by objective evidence of ongoing improvement. Across all programmes, a key concern relates to programme transparency. Each of these issues will be considered in greater detail.

In earlier work, More et al. (2017) highlighted a range of concerns relating to private standards and QA programmes, including the credibility of these standards, their potential as a discriminatory barrier to trade, the multiplicity of private standards that have been developed, the lack of consumer input and compliance costs. The first of these is perhaps the most important, given the potential influence of these programmes on consumer perception and action. In general, the current study found limited objective information in the public domain to support programme claims and a general lack of clarity on the role of science in the development and review of standards. That said, there are considerable differences between programmes. As one example, the Foqus planet programme provides objective evidence of ongoing AHW improvement among participants, using a range of indicators including antibiotic usage, cow lifespan and calf health and welfare. In contrast, the AHW standards in SDAS do not exceed the legislative baseline for AHW and this programme provides no objective, publicly available evidence in support of ongoing AHW improvement. Across all programmes, publicly available information is limited, in terms of programme governance and finances, the standard-setting process, the reporting of programme statistics (enrolment, coverage, compliance), and appeals process and decisions.

Each of the QA programmes operate in a commercial context. The

Table 5a

Aspects of the effectiveness of four quality assurance programmes, focusing on standards relevant to animal health and welfare, based on publicly available information.

	Foqus planet	Sustainable Dairy Assurance Scheme (SDAS)	Arlagården	RSPCA Assured
<u>The standards relevant to AHW</u> <i>Exceed the legislative baseline?</i>	Exceeds EU legislative baseline	Does not exceed the EU legislative baseline	Aligned to legislation in each of the countries in which it operates; exceeds the EU legislative baseline in Sweden and Denmark	Exceeds EU & UK legislative baseline and reasonably represents best-practice
<i>The role of science in the development of AHW standards. Clear separation of risk assessment and risk management?</i>	Science plays a major role. It is unclear if there is separation between risk assessment and risk management	Unclear to both questions	Unclear to both questions	Science plays a major role in standard design, application and evaluation. There is a clear separation between risk assessment and risk management
<i>Are any AHW criteria, control points or protocols used in the standards? Are animal-based measures included?</i>	Yes, there are both resource and animal-based measures	The standards include AHW criteria. There are resource-based, but no animal-based, measures	Yes, there are both resource and animal-based measures	Yes, there are both resource and animal-based measures
<i>Alignment to international public AHW standards or guidelines</i>	Aligned with the IDF and FAO guidelines for dairy farming	Aligned with international food hygiene standards	Aligned with international food hygiene standards	Yes, aligned with international guidelines on AHW (e.g. Five Freedoms)

RSPCA Assured programme specifically focuses on higher standards in farm animal welfare. The other programmes have a broader remit, with a primary focus on quality and sustainability, but also consider AHW. All of the programmes seek to provide an important opportunity for differentiation, both in local and global markets. The frame of reference for AHW differs between the programmes. With Foqus Planet, there is a desire to produce milk from 'healthy cows', whereas Arlagården and RSPCA Assured explicitly refer to animal welfare 'to assure' and 'improve the health and welfare of farmed animals', respectively. Notably, however, Foqus Planet is the only programme with publicly available evidence in support of achieving their primary goals for animal welfare. In the current evaluation, there were considerable programme differences (similarities were limited to 11 of the 32 criteria), highlighting the complexity associated with systematic comparison of AHW standards (Annen et al., 2013, Main et al., 2014). Farmers were identified as beneficiaries across programmes, through opportunities to sell directly to large retailers and wholesalers (SDAS and RSPCA Assured), to command higher prices (RSPCA Assured), to maximise farm incomes and facilitate farm continuity (Foqus planet), and through annual net profit sharing (Arlagården). Farmers also have the opportunity to benefit financially through performance premiums (Foqus planet and Arlagården) and through improvements to farm performance, supported by tools and advisory services (Arlagården and RSPCA Assured). Similar observations were highlighted in a recent review of the scientific literature on factors which affect farmer decision-making regarding farm animal welfare perception, where improved profitability and consumer acceptance were identified as the main reasons that farmers joined QA programmes (Balzani and Hanlon, 2020).

Among the four QA programmes, there are a number of notable examples of best-practice in AHW, with relevance both to policy and implementation:

a. Science-based evidence. Evidence-based decision-making, underpinned by science, is a fundamental requirement for the development of robust food policy instruments such as AHW standards and associated QA programmes. Programmes can draw on evidence from the increasing body of primary research (Freire & Nicol, 2019), however, expert opinion and codes of best-practice can also be incorporated. Several programmes offer examples of best-practice in this regard, both in terms of standard development and review. The RSPCA Assured standards are informed by science, including the AssureWel project (led collaboratively by the University of Bristol, RSPCA and the Soil Association) which developed a practical system of welfare outcome assessment for use in farm assurance programmes (AssureWel, undated (a)), including dairy production (AssureWel, undated (b)). The outputs from this project are well described in the scientific literature (including Heath

et al., 2014; van Dijk et al., 2018). Further, risk assessments are conducted with many stakeholders (farming industry representatives, veterinarians, and animal welfare and production scientists) on an ongoing and *ad hoc* basis to collect a wide range of evidence to aid the development of the RSPCA Assured scheme standards (van Dijk et al., 2019). In the Netherlands, AHW initiatives are also science-informed. KoeMonitor (ZuivelNL, 2021b) provides a measure of the welfare of the herd, as a practical implementation of the principles and criteria of Welfare Quality® (Blokhuis et al., 2010; Gibbons, 2019). Similarly, considerable research has been undertaken in support of KalfOK, which focuses on calf health and welfare (Santman-Berends et al., 2018, 2020). In the Netherlands, AHW initiatives are generally developed at a national level, including many, such as KoeMonitor and KalfOK, that are voluntary. Consequently, adoption of these programmes varies between dairy companies. In contrast, antibiotic usage and farm benchmarking is mandatory under national legislation. Therefore, at times there is no distinction between those requirements that are specific to Foqus planet and those applicable to all Dutch dairy farmers.

b. Separation of risk assessment and risk management. Linked to the previous point, a clear separation of science (risk assessment) and policy (risk management) is accepted as best-practice for robust decision-making at a European level. This model has been enshrined in the EU general food law since 2002 (see Regulation (EC) No 178/2002), directly in response to several food crises, including bovine spongiform encephalopathy (BSE) and dioxin (Houghton et al., 2008). Under this clear separation, there is clarity about the impartial scientific position, which is then considered by policy in among a range of other relevant factors, including politics, logistics, finances, etc, before a decision is made. This point is well-illustrated in the context of RSPCA Assured, where independent scientific research informs standards and QA programme development and review. The results from the AssureWel project were used to inform the work of the species-specific Standards Technical Advisory Groups during the design and review of the RSPCA Assured standards and QA programmes.

c. Animal-based measures. Assessment of AHW on-farm is challenging, and resource-based measurements such as floor type and space allocation have traditionally been used. In recent years, however, there was a shift towards increasing reliance on animal-based measures, such as lameness, body condition and cleanliness (Knierim and Winkler, 2009; Sandgren et al., 2009; Bertocchi et al., 2018), which reflect the outcome of the interaction of an animal with its environment (both housing design and management). Each of the QA programmes, except SDAS, include animal-based measures during their AHW assessment. RSPCA Assured were early adopters in this regard, benefiting from some of the initial research on animal-based measures at the University of Bristol,

Table 5b

Aspects of the effectiveness of four quality assurance programmes, focusing on programme performance (relevant to animal health and welfare) and programme operation (in general), based on publicly available information.

	Foqus planet	Sustainable Dairy Assurance Scheme (SDAS)	Arlagården	RSPCA Assured
The QA programme relevant to AHW (performance)				
<i>Objective evidence of ongoing improvement with respect to programme AHW outputs</i>	Yes, objective evidence for a range of indicators (antibiotic usage, cow lifespan, calf health and welfare, access to pasture)	None available	There is qualitative evidence of on-going improvement in AHW	None available
<i>Ongoing programme review, relevant to AHW</i>	There is ongoing development of national initiatives relevant to AHW (eg KoeKompas)	The standards have been updated once, and a broader update is anticipated	There is evidence of programme improvement and revision in AHW.	Under continuous review and improvement by expert working group
<i>Strategies to facilitate ongoing farm improvement in AHW</i>	Benchmarking is used extensively. Farmers have access to their own performance enabling them to benchmark against other farms and nationally	AHW is not benchmarked	AHW is benchmarked, and standards are being incrementally increased to support ongoing improvement	AHW is benchmarked and higher standards are used to support ongoing improvement and farmers receive feedback on the welfare outcome assessment results
The QA programme in general (operation)				
<i>Assessment of on-farm compliance</i>	A limited description of the on-farm audit process is available	Auditing is conducted at least every 18 months. A detailed description of the auditing process is available	Auditing is conducted every 3 years. A detailed description of the auditing process is available	Auditing is conducted every 12 months; farms may have unannounced inspections by the RSPCA Farm Livestock Officer
<i>Compliance consistency</i>	Compliance is assessed by an independent accredited audit company	Auditing is conducted by trained assessors. The relevant ISO standard can be purchased online	Auditing is conducted by qualified auditors, using an agreed reference tool	This information is not available
<i>How is non-compliance addressed</i>	A limited description of actions following non-compliance is available	The approach to addressing non-compliance, including sanctions, is clearly outlined	The approach to addressing non-compliance, including sanctions, is clearly outlined	Verification of conformity forms are issued in cases of non-compliance. Deadlines are set to address non-compliance, which vary depending on type and severity of problem

Table 6

General aspects of the efficiency of four quality assurance programmes, based on publicly available information.

	Foqus planet	Sustainable Dairy Assurance Scheme (SDAS)	Arlagården	RSPCA Assured
<i>Cost allocation</i>	This information is not available	This information is not available	This information is not available	Member farmers are charged an annual membership fee
<i>Synergies with existing regulatory on-farm auditing</i>	This information is not available	This information is not available	On-farm auditing is coordinated with other routinely collected data/ audits	This information is not available
<i>Synergies with national and/or sectoral efforts towards improved AHW</i>	The programme links to a series of national AHW initiatives, including the Sustainable Dairy Chain, responsible use of antibiotics, cow welfare and calf health and welfare	SDAS has linkages to relevant national organisations that coordinate or contribute to improved AHW	Arla Foods has established interactions with external partners to encourage innovation, but further information relating to AHW is not available	The programme is linked to national and international research efforts to improve AHW
<i>Linkages during programme (re-)design to national and/or international AHW research</i>	There are established research linkages, but relevant scientific articles may not be available	SDAS has linkages to relevant national organisations that conduct AHW research	There are established research linkages, but relevant scientific articles may not be available	The programme works synergistically with existing national/regional and sector efforts to improve AHW.

such as lameness scoring for dairy cows (Whay et al., 2003). To this point, there has been a primary focus on measures with an emphasis on negative welfare states (the Five Freedoms, including freedom from thirst, pain, fear, etc). In time, it will be important for QA programmes to consider incorporating positive animal welfare measures, to best reflect what has been termed 'a life worth living' (Mellor et al., 2015; Mellor, 2016).

d. *Farm benchmarking.* Benchmarking provide farmers with real-world data on their farm performance relative to their peers (Sumner et al., 2018, 2020), encouraging farmers to make management changes by identifying areas needing attention and promoting discussion about best-practice (Colditz et al., 2014; Sumner, 2018, 2020). Benchmarking has the potential to motivate incremental change on farms towards a desired goal (Balzani and Hanlon 2020), and also has considerable utility for country-level comparisons. Indeed, without a systematic comparison tool of animal welfare requirements across states and regions, Sandoe et al. (2020) argued that it is difficult to hold

governments, organisations producing animal products, and animal welfare non-governmental organisations accountable for having sufficient information to define meaningful animal welfare targets. Farm benchmarking is used extensively in the Foqus planet programme, and more broadly in the Dutch dairy industry, enabling farmers to compare their performance against peers and national results. In Arlagården, the programme database is used to develop training and support researchers to systematically analyse and to continuously develop simplified methods to better assess animal health. Similarly, RSPCA Assured gives feedback to producers to help monitor and improve AHW on their farms, including benchmarking based on the welfare outcomes assessment. In RSPCA Assured, the on-farm audit assessor discusses the audit report with the farmer, and provides advice for improvement where required.

e. *Ongoing programme-level metrics and measurement.* Within the broader Dutch dairy industry, which includes Foqus planet participants, national goals and indicators are clearly defined and there is reporting of performance towards these goals. Goals for 2030 relevant to AHW in the

Table 7

Aspects of the transparency of four quality assurance programmes, focusing on governance and operation of each programme in general, based on publicly available information.

	Foqus planet	Sustainable Dairy Assurance Scheme (SDAS)	Arlagården	RSPCA Assured
The QA programme in general (governance)				
<i>Availability of the on-farm standards</i>	The on-farm standard is not available. A summary of the programme requirements is available	The on-farm standard is available online	The on-farm standard is available online	The on-farm standard is available online
<i>Reporting of programme structure and activities</i>	Detailed information is available about corporate governance, including ISO 26,000 compliance, for FrieslandCampina, but not Foqus planet	Detailed information is available about corporate governance for Bord Bia, but not SDAS	Detailed information is available about corporate governance for Arla Foods, but not for Arlagården	Some information is available, including of the board of trustees, election results, notice of the annual general meeting and financial reports
<i>Governance structures to manage conflict of interest in the programme and/or standard-setting process</i>	Information about the management of conflicts of interest is available	Information about the management of conflicts of interest is available	This information is not available	This information is not available
<i>Availability of programme financial reporting</i>	Detailed information is available about financial reporting for FrieslandCampina, but not Foqus planet	Detailed information is available about financial reporting for Bord Bia, but not SDAS	Detailed information is available about financial reporting for Arla Foods, but not for Arlagården	Annual financial reports are available online for RSPCA. RSPCA Assured provide summary financial details in their annual report
<i>Reporting of the standards setting process</i>	No information is available specific to the setting of AHW standards in the programme	This information is not available	This information is not available	Comprehensive information of the standard-setting process is available
The QA programme in general (operations)				
<i>Transparent reporting of key programme statistics</i>	Foqus planet is a mandatory programme for all farmers who deliver to FrieslandCampina. Information on the number of farms deemed non-compliant is not available	Information is limited to number of farms enrolled	Some key programme statistics is available but there is no information on the numbers of compliant/non-compliant participants or programme coverage	Programme statistics are reported annually, but not by production sector
<i>Can decisions be appealed? Is there transparent reporting of the appeals process and decisions?</i>	This information is not available	Programme decisions can be appealed and the appeals process is presented. Information about appeal decisions are not available	Programme decisions can be appealed, however, no information about either the appeal process or decisions are available	This information is not available
<i>Is there transparent reporting of major programme developments and changes</i>	The Foqus planet programme has been modified, with the inclusion of national initiatives such as KalfOK and KoeKompas, and this is transparently reported	Programme developments and changes (e.g. introduction of calf welfare criteria) are available	Programme developments and changes are available (e.g. Climate check)	Major programme modifications are reported

Dutch dairy industry include responsible use of veterinary medicines (99% of farms below action values as calculated by the Veterinary Medicines Authority (SDa)), cow longevity (90% of farms to achieve the 2018 sector average), animal welfare (in 2021, finalising KoeKompas; in 2022, obtaining baseline measurements and setting targets), calf health and welfare (90% of dairy farms will have a KalfOK score higher than 75), outdoor grazing (maintain 2021 levels of outdoor grazing) (Zui-velNL, 2021a).

f. Ongoing programme review. Within the broader RSPCA Assured programmes (incorporating dairy cows, but also other species), a risk management process is used by their Standards Technical Advisory Groups to review and develop the standards through implementation of species-specific measurements. A framework for systematic review of standards is developed every 2 years, consistent with ongoing revision of programme-level metrics and measurement within the international quality assurance (ISO 9001) requirements for continuous improvement within a certified organisation, and should be considered as best-practice. The recommended examples of best-practice arising from this study are in line with suggestions from Main et al. (2014) who developed a best-practice framework for animal welfare certification schemes.

Assessment criteria for AHW has the potential to substantially change decision-making in the commercial setting, as demonstrated both by GlobalG.A.P. and the Business Benchmark on Farm Animal Welfare (BBFAW). GlobalG.A.P. is a proprietor-initiated world standard for good agricultural practice (see Campbell et al., 2006; Fuchs et al., 2009), providing a mechanism of food governance that is aimed at giving the public confidence that foods sold in supermarkets are safely

produced and handled (Campbell et al., 2006). Specifically, it is a business-to business protocol ensuring compliance with supermarket-driven private standards beyond national boundaries. In a similar way, but with a particular focus on animal welfare, BBFAW seeks to provide ‘companies with a clear set of expectations on farm AHW management practice and reporting, enabling them to benchmark themselves against industry peers and to progressively drive up welfare standards in their supply chains’ (Sullivan et al., 2017; Business Benchmark on Farm Animal Welfare, 2021). This is reflected in the most recent BBFAW annual report, from 2020, with 79% of 150 companies having formal overarching policies on farm animal welfare, including welfare-related objectives and targets (Amos et al., 2020). The BBFAW criteria places particular emphasis (as we have done in the current study) on reporting of animal welfare outcome measures (such as lameness, mastitis, body condition, involuntary culling rate). Although there are differences between the current conceptual framework and these two examples, particularly in terms of context and scope (for example, companies versus QA programmes, animal welfare versus AHW, all farmed species versus dairy cattle, respectively), all highlight the imperative of objective measurement coupled with transparent reporting. A number of aspects of the current study may be useful to GlobalG.A.P. and BBFAW, including the criteria within the conceptual framework that were used to evaluate effectiveness, efficiency and transparency, the examples of best-practice within the four QA programmes, and the broader lessons learned.

We faced several methodological challenges during this study. This work represents our first application of the conceptual framework, as

previously described by More et al. (2017) but with some adaptation. With this adaptation, the conceptual framework is now relevant to a broad variety of AHW standards and associated QA programmes, regardless of whether AHW is a primary or secondary programme goal. This was important, given the differences between the four QA programmes under review here, in terms of scope, objectives, structure, and operational methods. Further adaptation may be warranted, including the identification of beneficiaries on the basis of benefit:cost rather than benefit alone. This study was conducted based solely using publicly available information, which presented some challenges. Considerable care was taken to ensure that no publicly available information was missed. When gaps in such information were identified, we note that it was not possible to distinguish between 'absent information' (that is, it does not exist) or 'available but publicly inaccessible information'. These two alternatives will not alter our conclusions about programme transparency; in both cases, no information is available for the interested public. In contrast, our assessments of programme effectiveness and efficiency will be incomplete if information was available but not publicly available. Transparency, including transparent reporting as outlined in the conceptual framework, is undoubtedly in the public interest. In three of the four QA programmes (all except RSPCA Assured), sustainability or food quality was the primary programme goal and AHW was secondary. In contrast, AHW was the primary focus of RSPCA Assured. In other words, all programmes included some AHW claims. The conceptual framework was modified during this study specifically to maximise applicability, accounting for these programme differences. Perhaps a greater issue relates to the differing minimum legislative standards in the four relevant jurisdictions. These differences in context should be considered when interpreting the study results, and may preclude direct comparisons between QA programmes. In contrast to RSPCA Assured and SDAS, the QA programmes of FrieslandCampina and Arla Foods extend beyond the Netherlands and Denmark, respectively. For these two programmes, we focused solely on the country of origin, using Google Translate to access information that was not available in English. In such circumstances, there is always a risk of translation error.

7. Policy implications and conclusions

This study highlights the potential value of private standards and associated QA programmes to improve dairy cow welfare. In the Foqus planet programme, for example, there were measurable reductions in veterinary medicines usage, and improvements to cow longevity, animal welfare, calf health and welfare, and outdoor grazing. For this to be effective, however, there is a need both for programme transparency and consumer understanding. As reflected in the current study, problems were identified across all programmes with respect to transparency, and attempts to scrutinise claims across any of the four QA programmes would not be a straightforward process for most consumers. It seems counterintuitive that consumers are not facilitated in their ability to detect and interpret the quality of the goods they are purchasing (Carriquiry and Babock, 2007). The protection and enhancement of reputation is a key driver for companies to invest in QA programmes, and private standards are the first step on the trust ladder, working to maintain food safety and quality whilst concurrently safeguarding reputation (Richards et al., 2011). In their best-practice guidelines for voluntary certification schemes (here, QA programmes) for agricultural products and foodstuffs, the European Commission highlighted the potential of these programmes to provide consumers with reliable and trustworthy information on product and process attributes (European Commission, 2010). Further, they recommended that all claims should be based on objective and verifiable evidence and scientifically sound documentation, which are freely available (for example, on a website) (European Commission, 2010). It is well recognised that a lack of transparency can erode consumer trust (Richards et al., 2011), with direct implications for a company's reputation (Swift, 2002). The current study has reinforced many of the concerns expressed previously

about private standards and associated QA programmes, particularly those relating to the credibility of private standards and the potential use of standards as a discriminatory barrier to trade (More et al., 2017). That said, this work highlights substantial variation between programmes, points of strength and weakness within any particular QA programme, and a number of important examples of best-practice.

Fundamentally, there is a need for careful scrutiny of private standards and QA programmes, to provide consumers with assurance with respect to programme effectiveness (that is, 'whether the stated benefits to farmers, consumers and animals can be justified?') and programme transparency (that is, 'is sufficient information disclosed to enable objective appraisal by interested people of a QA programme and associated standards?'). In addition, these QA programmes have the potential to place considerable demands on individual farmers, and it is important that programme efficiencies are maximised (More et al., 2017). To this point, and by definition, private standards are 'at arms-length' of government, and organisations such as BBFAW and GlobalG.A.P. have adopted the role of programme assessment and critique to some degree. The European Commission's guidelines for best-practice for voluntary certification schemes (essentially QA programmes) included a series of recommendations regarding programme development, programme requirements and corresponding claims, certification and inspection, mutual recognition and benchmarking (European Commission, 2010). To our knowledge, however, they did not progress these recommendations further. There is a strong case for regulatory oversight of private standards in AHW and associated QA programmes, within existing or defined policy instruments, both to facilitate the positive impact of these programmes and to build confidence among consumers of the validity of programme claims. The results of the current study, including the criteria addressed with the conceptual framework, could usefully contribute to this discussion.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary data.

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