Animal Welfare in Public and Private Standards and On-Farm Compliance

Tierwohl in staatlichen Vorschriften und privaten Standards und ihre Einhaltung auf dem landwirtschaftlichen Betrieb

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Abstract

This paper evaluates the animal welfare situation on cattle farms in Germany and Austria applying a multidimensional assessment framework. Using minimum requirements formulated in public legislation and private certification schemes, animal needs indices are calculated. They are subsequently compared with results from on-farm surveys. Most private certification schemes address animal welfare in their requirements but this does not necessarily result in higher levels of farm animal welfare if they only overlap with existing national standards. The on-farm evaluations showed that most farms already voluntarily overcomply with some of the standards imposed by public legislation or private labels. Thus, proposals to simply increase standards to improve farm animal welfare without considering the already implemented on-farm animal welfare level have to be evaluated with caution.

Key Words

animal welfare; public and private standards; animal needs index

Zusammenfassung

Unter Nutzung eines indikatorengestützten Bewertungssystems untersucht diese Arbeit das Tierwohl auf rinderhaltenden Betrieben in Deutschland und Österreich. Mit Hilfe von Mindestanforderungen, wie sie in der relevanten Gesetzgebung und in privaten Zertifizierungssystemen formuliert sind, werden Tierwohlindikatoren berechnet. Anschließend werden diese mit den Ergebnissen von Kontrollen auf landwirtschaftlichen Betrieben verglichen. Die meisten privaten Zertifizierungssysteme berücksichtigen die Tiergerechtheit von Haltungsbedingungen in ihren Anforderungen, jedoch führt dies nicht unbedingt zu besseren Ergebnissen, wenn diese Anforderungen sich nur mit bestehenden rechtlichen Rahmenbedingungen überschneiden. Die Auswertung der betrieblichen Kontrollen zeigt, dass die meisten Betriebe bereits freiwillig die (Mindest-) Standards der öffentlichen und privaten Regelungen übererfüllen. So sind Vorschläge zur weiteren Verbesserung des Tierschutzes in der Landwirtschaft, die eine einfache Erhöhung der Mindestanforderungen beinhalten, hinsichtlich ihrer Wirkung auf das Tierwohl mit Vorsicht zu bewerten.

Schlüsselwörter

Tierwohl; staatliche Regelungen; private Standards; Indikatorensystem

1 Introduction

Compliance with private and public standards plays an increasing role for agricultural producers. Depending on the type of animal production, the spectrum of obligations ranges from requirements of food safety and quality to animal welfare standards (FARMER et al., 2007: 18f.). In particular animal welfare conditions are increasingly part of private schemes and widely applied across the food supply chain from retailers, over hauliers and slaughterhouses to farms (HORGAN and GAVINELLI, 2006: 304; VEISSIER et al., 2008: 284f.). However, an increased consideration of animal welfare obligations in private standards does not necessarily lead to a higher level of farm animal welfare, if they simply overlap with European and national legislation.

The scientific literature provides a wide variety of definitions of animal welfare. The animal-based standpoint by BROOM (1996) defines it as the "animal's state as regards its attempts to cope with its environment", whereas MCINERNEY (1994) explores the meaning of farm animal welfare as "a subset of man's perception of his own welfare". A more production-based approach is taken by KNIERIM (2002) who considers animal welfare as a criterion that measures to what extent housing conditions within the agricultural production system contribute to the animal's well being. As general principle to describe

animal well-being, the *Five Freedoms* defined by the FARM ANIMAL WELFARE COUNCIL (1993) have reached broad scientific consensus. The *Five Freedoms* form the conceptual basis of several farm animal welfare assessment methods. Based on the approach of DAWKINS (1993), they identify the determinants of the animals' own perception of their welfare state and define conditions to preserve it (WEBSTER, 2001: 233): (1) *Freedom from hunger and thirst* – by ready access to fresh water and a diet to maintain full health and vigour. (2) *Freedom from discomfort* – by providing an appropriate environment including shelter and a comfortable resting area. (3) *Freedom from pain, injury or disease* – by prevention or rapid diagnosis and treatment. (4) *Freedom to express normal behaviour* – by providing sufficient space, proper facilities and company of the animal's own kind. (5) *Freedom from fear and distress* – by ensuring conditions and treatment which avoid mental suffering.

There exists numerous ways to assess the welfare friendliness of the animal husbandry conditions on the farm. A first step may be a simple comparison of monitoring checklists of private and state-driven farm certification schemes. This, however, only allows a very limited judgement in terms of animal welfare even though some schemes show a grading into major, minor and facultative requirements. Their standardized measurements lead to yes/no answers that do not reflect differentiated on-farm animal welfare conditions and complicate comparisons among farms (BOTREAU et al., 2007: 1185). Single indicator evaluations of, say animal space, may offer a better approach, but still only show a very limited picture of the animal welfare situation. Hence, animal welfare assessment frameworks should be preferred (BOTREAU et al., 2007: 1180) as they involve a higher number of relevant parameters. Examples of these systems are provided by BARTUSSEK et al. (2000) with the Animal Needs Index (ANI) and others (e.g. BOTREAU et al., 2007; CAPDEVILLE and VEISSIER, 2001; HÖRNING, 2001; SCOTT et al., 2001). A general issue of integrated assessment systems arises in practice. Although most systems lack to some extent animal-based parameters in order to achieve a better practicability (WILLEN, 2004: 13), on-farm assessments require apart from time consuming on-site examination in most cases expert knowledge and/or techniques. This problem may be addressed when using instead livestock husbandry regulations given by legislative standards and farm certification schemes

to conduct evaluations of the mandatory minimum animal welfare status of farms. Precondition for this "desk-based" evaluation is the assumption that farms fully comply with legislative and/or certification standards and that the chosen assessment framework overlaps sufficiently with the official monitoring and certification indicators. Such an approach may allow using the costly and time-consuming on-farm visits for the systematic monitoring of farm compliance with all regulations and to control if the obligations really lead to animal welfare adequate husbandry conditions.

Building on this discussion of assessment frameworks and using a multidimensional assessment framework, this study contributes to the literature by providing an approach for the systematic evaluation of the legislative and farm certification system obligations regarding the question if the regulations establish the preconditions for welfare friendly animal husbandry. This analysis of the animal welfare situation on farms contributes to the current discussion regarding animal welfare of livestock. It deepens the understanding of the situation of animal welfare in a multidimensional concept as not only one single indicator is compared, but an assessment framework covering many indicators is used. The analysis is performed for Austria and Germany using the animal welfare minimum requirements formulated in public and private legislation and certification schemes as information basis for the calculation of an animal welfare index. The calculations based on minimum requirements for Austria are then compared with results from an on-farm animal welfare assessment done in Austria in the year 2009.

The next section proceeds with a description of the current regulatory environment, followed by an overview on the methodology and data in section 4. Section 5 presents the results and the article is rounded up with conclusion and recommendations in the final section.

2 Legislative and Private Standards ensuring Animal Welfare

EU-wide minimum animal welfare standards are formulated in the Statutory Management Requirements introduced with the Cross Compliance (CC) system which relate to obligations from already existing EU directives and regulations. For the cattle sector, the

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horizontal "Animal Protection Directive"[1] which is relevant for all farm animals and the "Calves Directive"[2] are the relevant legislative texts. This means that for adult cattle only general obligations regarding animal welfare are formulated (see also Table 2) whereas for calves more details are regulated specifically in a separate directive. For organic farming, the EU organic regulation[3] provides the relevant legislation. It imposes substantially stricter conditions compared to the legislative farming standards relevant for conventional farms in particular with respect to space allowance requirements in the stables, outdoor access, housing systems, feed stuff, and medication.

National animal welfare obligations must at least comply with European regulations. For Germany, the relevant EU legislation is mainly implemented in the "Regulation for Farmed Animals"[4] and the "Animal Welfare Act"[5]. Thus, as for the EU, no specific legislation for adult cattle exists. For Austria, the relevant legislation is found in the "Animal Protection Act"[6] and the "Regulation Concerning Minimum Requirements for the Keeping of […] Cattle […]"[7]. For adult cattle, Austrian law defines specific minimum welfare standards in particular with respect to locomotion and floor conditions. Thus, one can implicitly infer that these standards must be higher than EU requirements as there are no standards formulated on EU level for adult cattle.

Standards implemented by private labels may go on top of the minimum requirements formulated by national law or the EU organic farming regulation. In both study countries, there are numerous farm certification schemes and labels[8] that define their own requirements to be met by farmers and participants of the supply chains in order to be allowed to market the resulting products under the respective logo. At the same time, there are also farm certification schemes that go only marginally beyond the legislatively set standards but ensure full compliance with these stand-

ards via a high control intensity.[9] Thus, the present study will analyze the differences between legislative minimum animal welfare requirements and private standards and across the various labels and what the prescribed standards means in terms of the fulfillment of animal welfare needs.

3 Reference Frameworks to Evaluate Animal Welfare

In recent years, there has been a broad consensus among scientists that farm animal welfare should be regarded as a "multidimensional concept" (see e.g. RUSHEN and DE PASSILLÉ, 1992; FRASER, 1995; SØRENSEN and SANDØE, 2001: 3; BLOCKHUIS et al., 2003: 446; SMULDERS et al., 2006: 439; BOTREAU et al., 2009: 363). Methods for evaluating farm animal welfare vary in their share of environmentally- and animal-based assessment parameters. Environmentally-based parameters (e.g. space allowance or air-quality) focus on the evaluation of the animal's housing conditions and farm management; animal-based parameters assess the animal's responses to environmental influences affecting health, physiology and behaviour (JOHNSEN et al., 2001: 27). As the use of environmental-based parameters offers a less complicated, repeatable and relatively objective evaluation of minimum housing conditions given by legislative and certification standards, they are primarily involved in the overall animal welfare systems considered for this study. A detailed overview on integrated animal welfare assessment methods can be found in ANNEN (2012, section 1.6f.).

The Austrian "Animal Needs Index" (ANI) developed by BARTUSSEK (1990) represents the first index system to measure overall farm animal welfare at herd level which can be adapted to various livestock categories (e.g. cattle, BARTUSSEK et al., 2000). BARTUSSEK used the *Five Freedoms* as definition basis of farm animal welfare for this development. The implementation degree of the *Five Freedoms* in livestock housing can be assessed by innumerable physical, physiological, ethological, and anatomical indicators but to make an assessment tool useful, the number of indicators has to be limited. Thus, the ANIs principally regard five welfare aspects of farm ani-

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[1] Council Directive 98/58/EC (Article 4) (EC, 1998)

[2] Council Directive 91/629/EEC (Article 3 and 4) (EC, 1991)

[3] Council Regulation 834/2007 (EC, 2007)

[4] Tierschutz-Nutztierverordnung (BMELV, 2006a)

[5] Tierschutzgesetz (BMELV, 2006b)

[6] Bundestierschutzgesetz (BKA, 2004)

[7] Tierhaltungsverordnung (BMGF, 2004)

[8] E.g.: Conventional labels (QS, Neuland, Schirnhofer), organic labels (Bioland, demeter, Bioaustria, AMA-Bio).

[9] Further details on the relationship of public and private standards on the farm and the enforcement can be found in WIECK and ANNEN (2012).

Table 1.   Animal need index assessment categories and scales for adult cattle

ANI category	ANI assessment scales							Points
	a	**b**	**c**	**d**	**e**	**f**	**g**	
I. Locomo-tion	Loose housing		Tie-stalls		Outdoor exercise days/year	Pasture days/ year		
	Floor area	Lying down, rising	Cubicle/ stall size	Movement of tether				
Points	[0–3]	[0–3]	[0–1]	[0–1]	[1–3]	[0.5–1.5]		[0–10.5]
II. Social interaction	Floor area	Herd structure	Breeding	Outdoor exercise days/year	Pasture days/year			
Points	[0–3]	[-0.5–2]	[-0.5–1]	[0.5–2.5]	[0.5–1.5]			[-1–10]
III. Condition of flooring	Lying area			Activity areas	Outdoor yard	Pasture		
	Softness	Cleanliness	Slipperiness					
Points	[-0.5–2.5]	[-0.5–1]	[-0.5–1]	[-0.5–1]	[-0.5–1.5]	[0.5–1]		[-2.5–8]
IV. Light, air, noise	Light inten-sity	Air quality	Draughts in lying area	Noise intensity	Outdoor exercise days/year	Outdoor exercise hours/ day		
Points	[-0.5–2]	[-0.5–1.5]	[-0.5–1]	[-0.5–1]	[0.5–2]	[0.5–2]		[-2–9.5]
V. Stock-manship	Cleanliness of stables	Condition of equipment	Condition of inte-gument	Cleanliness of animals	Condition of hooves	Techno-pathies	Animal health	
Points	[-0.5–1]	[-0.5–1]	[-0.5–1]	[-0.5–0.5]	[-0.5–1.5]	[-0.5–1.5]	[-0.5–1.5]	[-3–8]
Minimum points								-8.5
Maximum points								46

Source: modified from Bartussek et al. (2000)

mals, represented by the evaluation categories "loco-motion" (freedom of movement), "social interaction", "condition of flooring", "light, air and noise" (climati-sation in the stables) and "stockmanship" (quality of stockman care). Bartussek (1999: Table 1) shows "ethologic and hygienic arguments" that underpin these five aspects of animal welfare. Apart from the freedom from hunger and thirst, all other defined freedoms relate to the ANI categories in different ways. A special focus is put on the freedom to display normal patterns of behaviour which is reflected in the assessment scales of every category. The missing assessment regarding malnutrition may be seen as a deficit.[10]

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[10]   As correctly pointed out by one of the anonymous re-viewers, during on-farm assessments, "lean" cows are detected on a regular basis. Even though well fed ani-mals may be in the own interest of the farmer, this indi-cates that there may be other reasons, as for example illness or problems with the energy balance of dairy cows in the first period of the lactation that lead to un-dernourished animals. Thus, the deficit of the ANI framework to account for this has to be acknowledged and should be addressed in future work.

An overview of the most recent version (the ANI35L/2000) of the ANI assessment scales and categories for cattle is given in Table 1. Each ANI category contains several assessment scales awarding points to different characteristics of the observed live-stock housing system. The better the animal welfare level of housing conditions, the higher the assigned points. All points are summed up to an overall ANI score allowing the compensation of poor results from one category with better ones from another. This compensation and the different weighting of assess-ment criteria is seen critical in the literature (e. g. Sandøe et al., 1996: 113f.; Bracke et al., 1999: 286ff.; 2001: 17; Alban et al., 2001: 100; Scott et al., 2001: 7f.).

The ANI was primarily developed for the evalua-tion of housing conditions on organic farms. General-ly, organic standards prescribe stricter free range and pasture requirements than comparable conventional standards. This results in a strong reward in the re-spective ANI categories which may lead to a bias in the ANI framework. Nevertheless, also in the scien-tific community, free range and pasture conditions are largely considered to be important determinants for farm animal welfare (Gonyou, 1996). As Bartussek (1999: 186) points out, all species used in livestock

Table 2.   Overlap between the ANI indicator set and official CC indicators for animal welfare

Calves Directive		
Short description of relevant obligations	No. of over-lapping ANI assessment scales	Share of points in final ANI [%]
Minimum space for group and individual housing	8	36.0
Perforated walls to allow visual and physical contact	1	5.6
Innocuous accommodation materials and construction	3	11.2
Adequate electrical circuits and equipment	1	3.4
Air circulation, temp. etc.	2	7.9
Suitable lighting	2	9.0
Condition of flooring	5	21.3
Inspections of automated and mechanical equipment	1	3.4
Sanitary standards	2	6.7
Inspections of calves	3	10.1
Restrictions for tethering, chains, muzzles, etc.	3	22.5
Diet and feeding intervals	0	0.0
Feed and water access	1	3.4
Animal care in case of illness and injury	3	12.4
Appropriate bedding	3	13.5
Provision of cow colostrums after birth	0	0.0

Animal Protection Directive		
Short description of relevant obligations	No. of over-lapping ANI assessment scales	Share of points in final ANI [%]
Freedom of movement / sufficient space	7	25.8
Accommodation for sick or injured animals	0	0.0
Innocuous accommodation material and construction	4	15.1
Keeping of animals for farming purposes	0	0.0
Air circulation, temp., etc.	2	7.5
Suitable lighting	2	7.5
Record keeping	1	2.2
Inspections of automated and mechanical equipment	1	3.2
Qualified and sufficient staff	0	0.0
Inspections of animals	3	10.8
Prohibition to administer harmful substances	1	4.3
Diet and feeding intervals	1	5.4
Feed and water access	2	8.6
Animal care in case of illness and injury	4	17.2
Protection for animals not kept in buildings	1	4.3
Requirements for breeding procedures	0	0.0
Conditions of mutilation	0	0.0

Source: own compilation

husbandry show a broad range of behavioural patterns and ethological functions demanding appropriate space allowance and possibilities of movement.

Several studies have proven the practicability and repeatability of the ANI framework (e.g. NAPOLITANO et al., 2009; POPESCU et al., 2009) and concluded that it provides an adequate framework for the evaluation of housing conditions of organic and conventional farm types. Moreover, the ANI shows among all assessment frameworks (e.g. TGI 200 by SUNDRUM et al., 1994; WELFARE QUALITY®, 2009; EFSA[11], 2009),

[11] Technically, the European Food Safety Authority (EFSA) does not offer with the publication "Scientific opinion of the Panel on Animal Health and Animal Welfare" (EFSA, 2009) an assessment framework, but only a scientific judgement regarding husbandry practices and how they adhere to welfare needs. But nevertheless, with this

the largest overlap with official CC monitoring parameters for cattle. This is illustrated in Table 2 where the numbers of ANI assessment scales that assess the respective obligation are indicated as well as the percentage weight that this obligation receives in the final ANI score. As an example, obligations concerning floor conditions given by the "Calves Directive" are addressed by five ANI scales accounting for 21.3% of reachable ANI points.

As most farm certification schemes follow legislative standards, it can be assumed that the ANI is also an appropriate instrument to evaluate their animal welfare requirements. But one could argue that it does

"scientific opinion", they provide, as the other mentioned reference frameworks, criteria with which the adequateness of husbandry conditions can be evaluated.

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not match the current state of science, as its development process started about 20 years ago. In this regard, the recently developed "WelfareQuality®" assessment system might be the better choice, as it considers more animal-based measures revealing the "direct" outcomes of the interaction between the animal and its environment (see e.g. JOHNSEN et al., 2001: 27; WELFARE QUALITY®, 2009). Generally, animal-based measures have to be conducted on-farm, are costly, and require assessment expertise. This is why this study proposes a different assessment approach as it evaluates animal welfare standards of compliant farms independent of time-consuming on-farm assessments. This independence of on-farm assessments has the disadvantage that no animal-based measures or health status of the animals can be assessed. But the ANI offers several assessment scales which at least allow an indirect inference on the animal health status based on evaluations of the cleanliness of the animals, or overall housing conditions. This may offset the before mentioned drawback and consequently may allow together with the already mentioned high practicability, assessment quality and overlap with official monitoring indicators of the ANI, to conclude that the ANI is an appropriate evaluation system in the context of this study.

4 Methodology and Data

4.1 Methodology

First, an inventory of mandatory and voluntary animal welfare standards applied in Austria and Germany is done. Second, the animal welfare standards are clustered into groups according to the similarity of imposed minimum requirements. Third, assuming full compliance of the participating farms, ANI scores for each animal welfare obligation in each cluster group are calculated using the ANI framework as the reference. By this, overlap between legislative and certification requirements across schemes and countries can be analysed and an evaluation of farm animal welfare levels as imposed by minimum requirements is possible. In a next step, the ANI cluster outcomes are compared with the results of ANI on-farm assessments. This was only possible for Austrian standards as the results from the on-farm check regarding the level of animal welfare were only available for Austrian farms. But nevertheless, this allows drawing conclusions on farm animal welfare as considered in private and public standards and regarding its implementation and compliance status on the farm.

Details of the Animal Welfare Assessment

The ANI is evaluated for horned[12] adult cattle with at least 500 kg of weight and calves (under the age of 6 months) weighting between 150 and 180 kg. Farms are distinguished by housing system (tie-stalls (TS) versus loose housing (LH)) and by production focus (suckler versus dairy cows) as animal conditions are very different for these categories. In addition, an ANI assessment for calves was done. The overall ANI assessment follows an approach already taken by ANNEN et al. (2011a) for the evaluation of farm animal welfare standards for fattening pigs in Austria and Germany.

To give an example how the approach is implemented, consider the assessment category "locomotion" and here the scale 1a related to "floor area". Based on the assessment sheet (BARTUSSEK et al., 2000), three points were awarded if the respective standard defines as a requirement that at least 9 square meter per livestock unit have to be provided by the farm for horned cattle. The number of points was adjusted accordingly, if the standard requires less floor area. If no requirement was set in the respective standard (e.g. scale 2e related to "number of pasture days/year"), then the legislative requirement was assumed and if no legislative requirement exists, then zero points were awarded for that specific item[13] (see also Figure 1 for scales that received zero points). If categories show a direct correlation to other categories, their ratings are adjusted to those of the correlating scales (e.g. scales 5a "cleanliness of the stables", 5c "condition of integument" and 5d "cleanliness of the animals" are correlated with each other; or scale 5e "condition of hooves" indicates a correlation to the ANI category 3 "condition of flooring"). In this manner, the operationalisation of all assessment scales was performed.

Thus, the overall calculated ANI scores for adult cattle and calves for each cluster of standards represent the minimum animal welfare level of livestock condi-

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[12] As pointed out by one of the anonymous referees, most dairy cows, at least in Germany, are unhorned. Hence, at least for the evaluation of German dairy cows, a more appropriate point of reference would have probably been "unhorned adult cattle". Given the final stage of this study, this cannot be changed any longer, but for future investigations, it is recommended to consider this point.

[13] This was most relevant for scales in the category "social interaction". In retrospect, in the final display of the results, it probably would have been advisable to distinguish between low standards and cases where no legislation exists instead of awarding "zero points" to both cases.

tions on a specific farm. In order to simplify further explanations, they are in the following referred to as *minimum ANIs*. As mentioned before, it is important to keep in mind that this approach does not use on-farm assessment of the housing conditions as it relies on the requirements formulated in the codes of practice or legislation. Thus the approach can only indirectly infer on the actual health status or behaviour of the animals.

Based on BARTUSSEK (1999), ANI ratings of animal welfare conditions for cattle are classified according to Table 3, as for example housing conditions that achieve less than 11 points in the evaluation are rated as "not suitable". To the opposite, livestock conditions scoring more than 28 points (out of 46 totally available) are rated as "very suitable".

Table 3.   Rating of animal welfare levels according to the ANI framework

Sum of ANI Points	Evaluation of ANI points with respect to welfare	Achieved ANI points expressed in percentage	Numerical grading
< 11	Not suitable	0 – 15	VI
11 - < 16	Scarcely suitable	16 – 30	V
16 - < 21	Somewhat suitable	31 – 50	IV
21 - 24	Fairly suitable	51 – 60	III
> 24 - 28	Suitable	61 – 75	II
> 28	Very suitable	> 75	I

Source: own representation based on BARTUSSEK (1999)

4.2 Data

Farm Certification Schemes

For cattle farming in Austria and Germany a wide spectrum of trade marks, conventional and organic farm associations and certifications of origin as well as monitoring bodies with logos indicating animal welfare reference exists. The selection criteria were that the schemes have to impose requirements, formulated in their codes of practice, with focus on livestock housing conditions. Moreover, the schemes have to ensure regular controls and enforce sanctions if obligations are not met. In a literature and internet research in the year 2009, all labels that fit into this criteria were included in the study.

On-Farm Assessments

During the period from February to March 2009, ANI on-farm evaluations were carried out on 40 Austrian cattle farms located all over Austria. Various public and private standards were relevant for the evaluated farms. Compliance with CC requirements was examined using official monitoring procedures. Further information on the evaluation can be found in WIECK and ANNEN (2013).

5   Results and Discussion

5.1 Inventory of Standards and Clustering to Groups

The number of standards as well as the resulting cluster groups are given in Table 4. This count involves farm certification, marketing schemes, as well as quality meat programmes. All results were anonymised according to the request of several labels. Altogether, 258 programmes/labels/standards could be identified for cattle that consider animal welfare obligations in their codes of practice. Nearly all reviewed programmes/labels/standards can be distinguished into several partly overlapping sub-standards for different livestock types kept in loose housing systems and tie stalls.

The conventional non-certified standard refers to the legislative minimum standard based on EU, CC and national law and represents the relevant requirements for all farms not participating in conventional or organic certification schemes. As there is no conventional standard for adult cattle farming defined by national law in Germany, the standard is instead given by the " Animal Protection Directive". The EU organic standard relates to the actual EU provisions for organic farming.

A more complex situation emerges for conventional and organic labels. From 27 reviewed private conventional labels in Austria, only one label for adult cattle and calves was found to have higher animal welfare requirements than the conventional non-certified standard. For all other conventional labels, no separate clusters were formed. With 66 private conventional labels clustered to ten groups with differing animal welfare requirements, Germany shows a wider range of schemes than Austria. Although considerably more Austrian than German private organic labels were identified, eight cluster groups for both countries could be formed indicating that the animal welfare requirements between the labels were more divers in Germany than in Austria.

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Table 4. Number of reviewed standards and of derived clusters

Livestock type	Housing system	Conventional non-certified std.		EU organic std.		Conventional labels		Organic labels	
		Reviewed	Cluster	Reviewed	Cluster	Reviewed	Cluster	Reviewed	Cluster
Austria									
Suckler cows	LH	1	1	1	1	5	0	26	2
	TS	1	1	1	1	5	0	26	1
Dairy cattle	LH	1	1	1	1	4	1	25	1
	TS	1	1	1	1	4	0	25	1
Suckler calves	LH	1	1	1	1	5	0	26	1
Dairy calves	LH	1	1	1	1	4	1	25	2
Germany									
Suckler cows	LH	1	1	1	1	11	2	18	2
	TS	1	1	1	1	11	1	18	0
Dairy cattle	LH	1	1	1	1	11	2	17	2
	TS	1	1	1	1	11	1	17	0
Suckler calves	LH	1	1	1	1	11	2	18	2
Dairy calves	LH	1	1	1	1	11	2	17	2

Source: own compilation

5.2 Animal Welfare Evaluation of Public and Private Standards' Minimum Requirements

In this section, the minimum animal welfare requirements of the clustered standard groups are reported differentiated by the five ANI categories. The calculated minimum ANIs reflect the minimum animal welfare level of the standards in each cluster. This calculated information may also be used to explore the overlap between animal welfare requirements of private and public standards. Generally, legislative standards prescribe the lowest animal welfare requirements and accordingly achieve the lowest minimum ANIs. But in some EU member states, as for example Austria, European law is exceeded by national regulations resulting in a higher minimum ANIs for the legislative standard and potentially higher minimum ANIs of private certification schemes.

5.2.1 Standards for Calves

We distinguish calves raised by suckler and dairy cows. As the "Calves Directive" does not allow raising calves in tie-stalls, a further classification into housing systems is not necessary. The outcomes of the calculations are presented in Table 5 for Austrian and in Table 6 for German calves standards.

Overall, the ANI values for Austrian standard clusters show similarity with those for Germany. In the case of the ANI shares for the conventional non-certified standard, this can be traced back to the overlap of national obligations with the respective CC requirements. The same applies to the obligations imposed by the EU organic standard that completely overlap with national legislation in Austria and Germany. They are exceeded by several organic schemes with slightly higher minimum requirements.

The lowest minimum level of animal welfare for Austrian calves is defined by the conventional non-certified standard, whereas the ANI shares of all other standards indicate considerably higher minimum requirements. The strong variation in the ANI shares of the categories "locomotion" and "social interaction" can be traced back to considerable deviations of the standards' minimum space allowance, free range and pasture obligations. The substantially lower variation of the ANI shares of the remaining categories "condition of flooring", "light, air, noise" and "stockmanship" can to some extent be ascribed to comparably high ANI shares of the conventional non-certified standard and the specific weighting of the respective ANI indicator scales that involve a more subjective assessment of attributes that do hardly differ among the standards sets. The organic schemes show especially in the category "social interaction" strong variation, but they are in line with the shares calculated for the EU organic standard. The ANI shares assigned to the conventional scheme show substantial deviation from the conventional non-certified standard and take

values comparable to the EU organic standard. In reference to the ANI category "light, air, noise", they even reach the highest values.

Using the animal welfare grading inherent in the ANI framework, overall, animal welfare conditions on Austrian farms can be rated as "suitable" or even "very suitable" with a slight markdown for the situation on farms not participating in any certification scheme, but adhering only to national law. In Germany, the picture is similar with high ratings ("suitable", "very suitable") for the minimum requirements in organic schemes, whereas the conventional certified and non-certified requirements leave room for further animal welfare improvement (rated with "somewhat suitable").

5.2.2 Standards for Adult Cattle

For adult cattle, the clusters of standards are differentiated according to production type and housing system. The results for Austria are presented in Table 7, for Germany in Table 8. Across all schemes, the lowest average ANI shares are allotted to dairy farms fitted with tie-stalls. Farms with dairy cows managed in loose housings already reach substantially higher animal welfare evaluations, especially with respect to the categories "locomotion" and "social interaction" (with the exception of the group accounting for compliance with national law only). These categories contain several indicator scales enabling a precise assessment of the animal's space allowance under considera-

Table 5. Animal welfare evaluation of minimum requirements for calves in Austria

	Cluster	Share of points per ANI category [%]								Animal welfare grading
		Loco-motion	Social interac.	Cond. flooring	Light, air, noise	Stockm.ship		Average		
						A	B	A	B	
Suckler calves	Conv. non-cert.	50	43	48	45	55	62	48	50	IV
	EU organic	77	67	67	64	68	76	68	70	II
	Organic scheme 1	77	67	71	68	68	76	70	72	II
Dairy calves	Conv. non-cert.	50	24	48	45	55	62	44	46	IV
	Conv. scheme	77	62	76	73	64	67	70	71	II
	EU organic	77	48	67	64	68	76	65	66	II
	Organic scheme 1	77	48	71	68	68	76	67	68	II
	Organic scheme 2	100	81	71	77	73	81	80	82	I

Note: A: applies to cattle farms that keep more than 50 calves per year; B: applies to cattle farms that keep a maximum of 50 calves per year.
Source: own compilation

Table 6. Animal welfare evaluation of minimum requirements for calves in Germany

	Cluster	Share of points per ANI category [%]								Animal welfare grading
		Loco-motion	Social interac.	Cond. flooring	Light, air, noise	Stockm.ship		Average		
						A	B	A	B	
Suckler calves	Conv. non-cert.	50	43	48	45	55	62	48	50	IV
	Conv. scheme 1	50	43	48	50	55	62	49	51	A: IV; B:III
	Conv. scheme 2	91	76	81	82	68	76	80	81	I
	EU organic	77	67	67	64	68	76	68	70	II
	Organic scheme 1	86	76	67	68	73	81	74	76	A: II; B: I
	Organic scheme 2	95	86	71	64	73	81	78	79	I
Dairy calves	Conv. non-cert.	50	24	48	45	55	62	44	46	IV
	Conv. scheme 1	50	24	48	50	55	62	45	47	IV
	Conv. scheme 2	91	71	81	82	68	76	79	80	I
	EU organic	77	48	67	64	68	76	65	66	II
	Organic scheme 1	86	57	67	68	73	81	70	72	II
	Organic scheme 2	95	67	71	64	73	81	74	76	A: II; B: I

Note: A: applies to cattle farms that keep more than 50 calves per year; B: applies to cattle farms that keep a maximum of 50 calves per year.
Source: own compilation

tion of the applied housing system. The same applies to clusters of standards for suckler cow farms. Although they achieve, due to their characteristic herd structure, considerably higher ANI results for "social interaction" than those of comparable dairy farm standards, the application of tie-stalls also leads to a decrease of the respective values and animal welfare grading.

Table 7.   Animal welfare evaluation of minimum requirements for adult cattle in Austria

	Cluster	Share of points per ANI category [%]						Animal welfare grading
		Loco-motion	Social interac.	Cond. flooring	Light, air, noise	Stock-m.ship	Aver-age	
Suckler cows (loose housing)	Conv., non-cert.	29	18	62	39	59	41	IV
	EU organic std.	62	50	67	52	64	59	III
	Organic scheme 1	62	50	71	57	64	61	II
	Organic scheme 2	90	82	67	83	73	79	I
Suckler cows (tie-stalls)	Conv. non-cert.	10	23	57	39	59	38	IV
	EU organic std.	29	36	67	52	64	50	IV
	Organic scheme 1	29	36	71	57	64	51	III
Dairy cattle (loose housing)	Conv., non-cert.	29	0	62	39	59	38	IV
	Conv. scheme	90	68	81	70	59	74	II
	EU organic std.	62	32	67	52	64	55	III
	Organic scheme 1	62	32	71	57	64	57	III
Dairy cattle (tie-stalls)	Conv., non-cert.	10	5	57	39	59	34	IV
	EU organic std.	29	18	67	52	64	46	IV
	Organic scheme 1	29	18	71	57	64	48	IV

Source**:** own compilation

Table 8.   Animal welfare evaluation of minimum requirements for adult cattle in Germany

	Cluster	Share of points per ANI category [%]						Animal welfare grading
		Loco-motion	Social interac.	Cond. flooring	Light, air, noise	Stock-m.ship	Aver-age	
Suckler cows (loose housing)	Conv., non-cert.	19	18	38	39	55	34	IV
	Conv. scheme 1	19	18	48	43	59	37	IV
	Conv. scheme 2	90	77	86	74	64	78	I
	EU organic std.	62	50	67	52	64	59	III
	Organic sch. 1	71	59	67	57	73	65	II
	Organic sch. 2	71	59	67	70	73	68	II
Suckler cows (tie-stalls)	Conv., non-cert.	10	23	33	39	55	32	IV
	Conv. scheme 1	10	23	43	43	59	36	IV
	EU organic std.	29	36	67	52	64	50	III
Dairy cattle (loose housing)	Conv., non-cert.	19	0	38	39	55	30	IV
	Conv. scheme 1	19	0	48	43	59	34	IV
	Conv. scheme 2	90	73	86	74	64	77	I
	EU organic std.	62	32	67	52	64	55	III
	Organic sch. 1	71	41	67	57	73	62	II
	Organic sch. 2	71	41	67	70	73	64	II
Dairy cattle (tie-stalls)	Conv., non-cert.	10	5	33	39	55	28	V
	Conv. scheme 1	10	5	43	43	59	32	IV
	EU organic std.	29	18	67	52	64	46	IV

Source: own compilation

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In general, it can be noticed that clusters of organic standards reach substantially higher average ANI shares than those associated to the conventional non-certified standard. Both legislative standards, the conventional non-certified as well as the EU organic standard are exceeded by private certification schemes imposing higher minimum requirements. Although the highest average ANI result is achieved by a private organic scheme, a private conventional scheme also scores rather well, in particular for the requirements regarding the "condition of flooring".

The ANI results detected for Austrian calves standards show strong overlap with those calculated for Austrian adult cattle standards. Both evaluations highlight the large differences in requirements regarding the categories "locomotion" and "social interaction". These similarities can be related to the basic legislative CC obligations and the EU organic standards as they impose overlapping requirements for both types of animals. The same holds for private schemes, as here no distinction of requirements for adult cattle is made either.

Considering of the housing systems, the standard clusters identified for German adult cattle are distinguished into legislative conventional and organic standards and two groups each, aggregating conventional and organic schemes. Compared to the previous evaluations, the German adult cattle standards show in nearly all categories the largest differences in the ANI scores. This may be explained by the large differences between the clusters but also with the low results for conventional non-certified standard. Furthermore, the already high obligations imposed by the EU organic standard and organic certification schemes are exceeded by a conventional scheme reaching the highest ANI point shares in four categories (locomotion, floor conditions, social interaction, light & noise intensity, air quality).

The ANI shares for cattle hold in farms that follow national law ("conventional non-certified") are in nearly all categories considerably lower than those calculated for comparable Austrian adult cattle standards. This is due to the absence of specific national laws in Germany contrary to the situation in Austria where specific requirements for cattle farms are regulated that exceed the European requirements, at least to some extent. The German obligations for cattle farming simply meet the European CC guidelines given by the "Animal Protection Directive" formulated in more general terms and applying to all livestock types.[14]

Moreover, the ANI shares detected for German calves' standards show strong overlap with those calculated for German adult cattle. As mentioned before, this can be ascribed to partially overlapping requirements imposed by the legislative standards and certification schemes.

Overall, if a grading based on the ANI concept of animal welfare is performed, the results indicate that the combination of tie-stalls with non-participation in any certification scheme leads to a "scarcely suitable" situation for adult cattle on farms which only marginally improved if the farm participates in conventional or organic schemes (grading IV "somewhat suitable"). Loose housing systems improve the animal welfare situation where several schemes (Organic Scheme 2 in Austria, Conventional Scheme 2 in Germany) impose requirements that are evaluated very positively ("very suitable") but overall, also for this housing system, the results for "conventional, non-certified" farms still lead to a low animal welfare evaluation grading ("somewhat suitable"). The remaining clusters are graded into "fairly suitable" and "suitable", which may result in the conclusion that the animal welfare status is acceptable but further improvements still are not totally out of range.

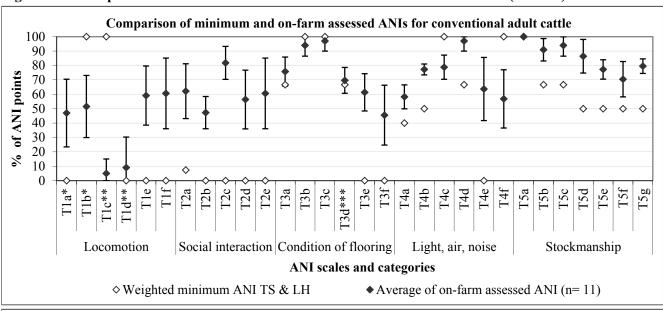### 5.2.3 Comparison of Minimum Requirements with On-Farm Assessments in Austria

As already mentioned in section 3, current outcomes of on-farm ANI assessments conducted in Austria are available.[15] Hence, in Figure 1 the calculated minimum ANIs based on full compliance with Austrian law and certification obligations are plotted against the averages of on-farm measured ANI scores. In this regard, the abbreviations T1a to T5g represent the respective ANI assessment scales already described in Table 1. As in the on-farm assessment of animal welfare, only conventional non-certified farms and organic farms participated only these two groups can be compared. In case of conventional non-certified farms (top panel in Figure 1), assessments were involved on farms fitted with tie-stalls and those equipped with loose housings. Therefore, the calculated minimum values represent the average of the two evaluations
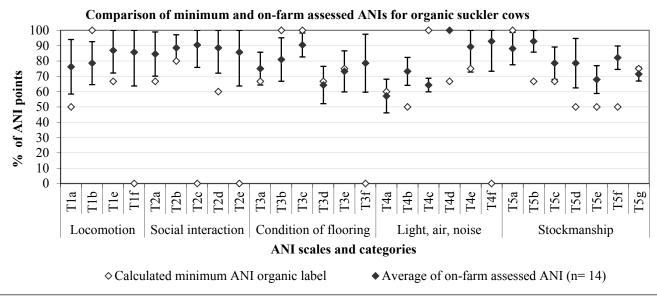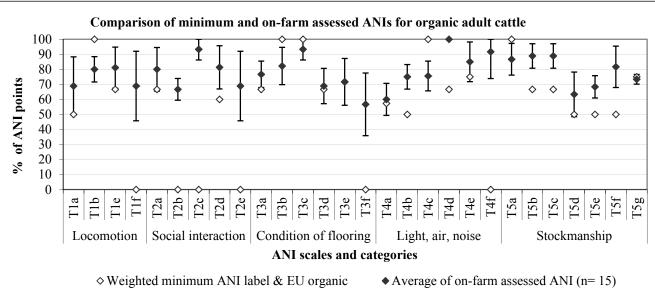
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[14] Further details can be found in ANNEN et al. (2011b).

[15] In 2009, in the context of the CCAT research project, a survey on 65 farms in Austria was conducted. Main survey focus was on farmer's behaviour and opinions regarding CC, but, supported by an Austrian veterinary official, an inspection of the animal confinements was done and data was collected to calculate the on-farm ANIs. More information on the survey results can be found in WIECK and ANNEN (2013).

Figure 1.   Comparison of minimum and on-farm assessed ANIs for adult cattle (Austria)

Note: * A loose housing systems is assumed; ** A tie-stalls is assumed; *** In case of tie-stalls, an outside run is available for the animals.
Source: own compilation

weighted with the shares of farms using the respective housing systems. The same procedure is applied to the calculated minimum values for organic adult cattle (middle panel in Figure 1). As the on-farm assessments were conducted on farms certified under either a private organic label or the EU organic standard, the presented average minimum values were also weighted according to the shares of these farms. For adult cattle kept in loose housing systems associated to a private Austrian organic label, an additional differentiation into suckler cows (bottom panel in Figure 1) and dairy cows was carried out. For organic adult cattle the application of loose housing systems is assumed.

Generally, it can be observed that considering the respective animal type, housing environment and/or certification grade, the calculated minimum ANIs ("dotted lines") are in most categories considerably lower than the averages of the on-farm measured ANI values ("solid lines"). Thus, we observe voluntary over-compliance on the farms. This may be explained by positive impacts on animal health and farm profits that drive farmers to provide larger space, outdoor access and other amenities to their herds, but the result may in part also be due to the methodological challenges in calculating the minimum ANIs, as described previously in section 4. Hence, the minimum ANIs may be calculated too conservatively. The consequence would be that we do not observe as much voluntary over-compliance as stated in Figure 1. Nevertheless, what can be said with certainty across all animal types is that only for few assessment scales the full number of ANI points was reached in the on-farm assessment. Thus, improvements towards fully satisfactory housing conditions and higher levels of animal welfare are still possible. This effect could be achieved by either increasing the minimum requirements of public or private standards or by voluntary (financial) incentives for farmers to improve the housing conditions.

The detailed analysis shows, that especially in the categories "social interaction", "light, air, noise" and "stockmanship", on-farm measured values exceed substantially the calculated minimum shares. But also concerning the animals' access to free range and pasture (assessed in the scales T1e, T1f, T2d, T2e, T4e, T4f), good ANI results are achieved. Under-compliance, i.e. violations against minimum requirements for space allowance (T1b and T1c) and slipperiness of the lying area (T3c) could be detected for both farm types and a slight breach was noticed regarding animal health (T5g) for organic suckler cows only.

One of the five indicator scales in the category "social interaction" focuses on requirements not cov-

ered by European or national legislation. This enlarges the differences between the calculated and on-farm measured shares. Nevertheless, for this category "social interaction", high ANI values are detected indicating that even in absence of regulation, farms voluntarily fulfill animal welfare needs. With respect to floor and space allowance conditions in the stable ("locomotion"), the on-farm measured ANI values show a lower deviation from the calculated minimum requirements indicating lower levels of voluntary over-compliance. Considering the relatively high level of legislative requirements in this field, an increased risk of non-compliance may be expected and should accordingly be considered in public controls.

Although conventional farms show in the ANI categories "locomotion" and "social interaction" considerably lower on-farm ANI results than organic farms, they reach in nearly all assessment scales of the category "stockmanship" higher ANI shares than their organic counterparts. This can to some extent be ascribed to the ANI indicator structure where the ANI assessment scales of the category "stockmanship" allow, due to the more subjective design, a greater margin of discretion. Nevertheless, due to an indirect correlation of several assessment scales of the category "stockmanship" with those involved in the categories "locomotion", "social interaction" and "condition of flooring", one would have assumed higher ANI results for organic farms in the area of "stockmanship".

6 Conclusions

Using animal welfare minimum requirements laid down in public and private legislation and certification schemes as information basis, animal needs indices considering the categories locomotion, flooring and space conditions, social interaction, and stockmanship for calves, suckler cows, and dairy cows are calculated considering different housing systems. The calculation assumes that farms fully comply with all standards and laws. Subsequently, these calculated results are compared with previously on-farm assessed animal housing conditions in Austria. Some additional assumptions, further discussed in section 3, regarding the interpretation of the regulations and the use of the animal needs index had to be made in order to come up with the results.

Contrary to Austria, in Germany no national law exists that further specifies the CC guidelines given by the "Animal Protection Directive". This is reflected in the calculated minimum ANIs. In nearly all ANI cate-

gories for adult cattle (both suckler and dairy cows) the ANI scores are considerably lower than for Austrian adult cattle. The housing system is relevant for the evaluation as cattle farms with tie-stalls reach significant lower animal welfare levels than those with loose housings. In terms of grading of the animal welfare situation, for tie-stalls only "scarcely or somewhat suitable" minimum conditions could be identified. For loose stalls and all other schemes, the animal welfare situation ranges mostly in the categories "fairly suitable" and "suitable".

Several certification schemes address animal welfare in their obligations but this increased integration does not necessarily result in higher levels of farm animal welfare if they only overlap with existing national standards as this is for example the case for the "Conventional scheme 1" in Germany for adult cattle. In average, suckler cow farms have better animal welfare conditions than comparable dairy farms in which most of the impact results from better evaluations in the category "social interaction". The animal welfare situation for calves is somewhat better where conditions can be rated as "suitable" or even "very suitable" for most standards with a slight markdown for the situation on farms complying with national law only. Apart from cattle hold in tie-stalls, organic schemes always score somewhat higher than conventional schemes.

Recent results from a field study allowed a comparison of the calculated minimum ANIs with on-farm measured ANIs disclosing the actual housing and animal welfare situation on farms. Farmers may have an incentive to exceed minimum requirements in order to reach best production and financial results for their farm. This is in line with the finding that substantially higher on-farm ANI results are detected especially for the categories "social interaction", "stockmanship" and "light & air quality, noise intensity" but also regarding access to free range and pasture. Conventional and organic farms show more similar on-farm animal welfare results than differences in the calculated minimum ANI values for both farm types indicate. Minimum animal welfare standards as regulated by CC directives and national law lead to only "somewhat suitable" animal welfare conditions. If private standards enforce higher requirements, this is directly reflected in higher scores in the animal welfare evaluations. But the on-farm evaluations showed that most farms already voluntarily implement higher standards (i.e. over-comply) than imposed by public legislation or private labels. Thus, proposals to simply increase standards to improve farm animal welfare without considering the already implemented on-farm level have to be evaluated with caution. Given the on-farm findings from our study, it is recommended that the current situation on farms regarding relevant animal welfare standards (e.g. floor area, floor conditions, activity area, animal health) is systematically assessed in order to ensure that a new or adjusted standard goes beyond the currently implemented level.

The detected overlap of the ANI indicators with official farm monitoring and certification indicators ensures a cost-efficient evaluation of minimum requirements without time-consuming on-farm measurements if farms comply with the regulations. Nevertheless, on-farm control visits should not be reduced to zero as they still form an important element in the control of actual farm compliance with the regulations and for the monitoring of animal health and animal behavior. For farms not or only partly complying with the standards, the chosen approach is not suitable as it does not consider the individual on-farm compliance situation. For the future, a more systematic comparison of on-farm results with "desk-based" approach may offer interesting perspectives for the monitoring of the animal welfare situation on farms.

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