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A review of the animal needs index (ANI) for the assessment of animals' well-being in the housing systems for Austrian proprietary products and legislation

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Abstract

An "Animal Needs Index" ANI (German: "Tiergerechtheitsindex" TGI) was developed to be used primarily at farm level as an instrument for assessing and grading livestock housing with respect to the well-being of the animals. Today, several different systems exist. The approach pursued in Austria (ANI 35 L) considers five husbandry conditions: (1) possibility of mobility, (2) social contact, (3) condition of flooring, (4) stable climate (including light and noise) and (5) stockman's care. Scoring leads to a sum of points. The ANI values have been divided up into different grades of good or poor animal welfare. The ANI is a pragmatic system, based on a consensus of people responsible for animal welfare products and therefore reduces conflicts between farmers' situations and consumers' expectations. It is used officially in Austria, mainly in controlling organic farming and in connection with animal welfare legislation. An inquiry into the experiences of 11 Austrian organisations employing 176 people who control livestock systems using the ANI showed that about 20,000 stables were checked. The ANI system proved to be practical and satisfactory. The selection of parameters is discussed and the development of the ANI is linked to the general welfare literature and to other similar efforts.

Keywords: Animal welfare; Assessment of animal welfare; Animal needs index ANI (TGI); Welfare categories; Animal protection legislation; Welfare products; Organic livestock products

1. Introduction

Recent concepts of sustainability in animal production argue that sustainable animal production systems should also satisfy agreed criteria for human and animal welfare (Spedding, 1995). Consumers are increasingly demanding livestock products that are produced with consideration to animals' needs (Pfingstner, 1993; Aeby, 1994; Wehrle, 1994; Hingst and Ortner, 1995; Zittmayr, 1996). To assess the influence of different management systems on animal well-being, some kind of assessment tool is needed that can be applied to a wide variety of production systems, methods and locations at farm level, with the objective of ensuring certain required standards for animal welfare. For that purpose, an "Animal Needs Index", ANI (Tiergerechtheitsindex, TGI) has been in development in Austria since 1985 (Bartussek, 1988, 1990, 1991, 1992, 1995a,b, 1996a,b). A

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similar index, using the same term (Tiergerechtheitsindex), was derived in Germany (Sundrum et al., 1994), however, it is not yet comparable to the Austrian system in structure and detail. To distinguish between the two indices, a number was added (in Austria 35, in Germany 200), representing the original maximum of index points achievable. This paper will mainly review the Austrian system, ANI-35, in its recent long version ANI-35-L.

2. Description of the Austrian ANI-system (ANI-35-L)

The Animal Needs Index "ANI-35" considers five components of the animal's environment, (1) the possibility of mobility, (2) social contact with members of the same species, (3) condition of the floors on which animals are lying, standing and walking, (4) stable climate (including ventilation, light and noise) and (5) the the intensity of human care. Within each component, several species-specific parameters are graded by points. Conditions that are considered to improve animal welfare are awarded more points. The overall sum of the points gives the ANI-value. The system offers the possibility of compensating poor conditions within one component with a better situation within another component, thus giving the farmer several possibilities for improving the evaluation result if the ANI-number achieved is not high enough to meet a certain requirement. So, outside exercise, for example, balances spatial restriction within the stable, careful handling of animals compensates for other deficiencies of the husbandry system. However, if minimum spatial requirements and other minimal conditions that are necessary to avoid unacceptable stress or damage to the animals are not fulfilled, a calculated ANI- number is only valid provided the deficiency is removed within a reasonable time (proviso clause). As an example, the ANI system for cattle used in Austria (TGI-35-L 1996; Bartussek, 1996a) is shown in Table 1. Within the five fields of influence, 24 different criteria are assessed. Each criterion can be graded up to a maximum of plus 3.0 points in the best situation, or down to minus 0.5 points in the worst case. The sum of all possible points ranges over 57 points, from -9 to $+48$ points. However, as some parameters for tied housing and for loose housing are exclusive, the actual possible maximum is only $+45.5$. The calculated absolute maximum is 36.5 points ($= +45.5 - 9.0 = 36.5$), with $+18.25$ points as the mean value.

3. ANI-welfare categories and ANI-application in Austria

On the basis of the original ANI-35 of 1988/90, with a range of 28 points between seven and 35 (the first tests proved the necessity to integrate more parameters, which led to the longer system ANI-35-L; Bartussek, 1992), it was proposed to grade the ANI-numbers or -values with respect to animal welfare (Bartussek, 1988, 1990; adapted 1995). Six welfare categories were intended (in parentheses: corresponding percentage of the range of points)

- < 11 = not suitable with respect to welfare (0–15%)
- $11- < 16$ = scarcely suitable with respect to welfare (16–30%)
- $16- < 21$ = little (mediocre) suitable with respect to welfare (31–50%)
- 21–24 = fairly suitable with respect to welfare (51–60%)
- > 24–28 = suitable with respect to welfare (61–75%)
- > 28 = very suitable with respect to welfare ($> 75\%$)

Recent ANI-35-L-systems exist and are in use for cows, young cattle and beef cattle (1995, amended in 1996; Bartussek, 1996a), for calves (1996; Bartussek, 1996b), for laying hens (1995; Bartussek, 1995a) and for piglets and fattening pigs (1995; Bartussek, 1995b).

Before Austria joined the EU (1995), legal regulations for organic farmers comprised a rigid and obligatory list of housing conditions, considered to be optimal, each of which had to be met. They were carried out by officials of the same private organic farming organisation of which the farmer was a member. Exceptions to the regulations were officially possible if the general welfare situation for the animals was assessed as good. In the past, exception

Table 1
Structure of ANI (TGI-35 L/1996) for young cattle, beef cattle and cows

Fields of influence to be evaluated	Ethologic and hygienic arguments	Criteria to be evaluated within fields of influence	Points (min.–max.)
I. Possibility of mobility	Sufficient movement	Area per animal, m^2/500 kg	0–3.0
	Normal behaviour at	Rising, lying down in loose h.	0–3.0
	resting, lying, rising,	Tied housing	0–2.0
	Five "freedoms" according to the	Outside exercise	0–3.0
	Brambell Report, (Brambell, 1965)	Alpine pasture/pasture	0–1.5
II. Social contact	Agricultural animals are social	Area per animal, m^2/500 kg	0–3.0
	species	Social structure of herd	−0.5–2.0
	Essential needs for	integration of followers	−0.5–1.0
	species-specific social	Outside exercise	0–2.5
	contact and behaviour	Alpine pasture/pasture	0–1.5
III. Quality of flooring	Permanent contact,	Resilience of lying area	−0.5–2.5
	Important effects on	Cleanliness of lying area	−0.5–1.0
	behaviour,	Slip resistance of lying area	−0.5–1.0
	hygiene,	Floor condition, moving area	−0.5–1.0
	health and	Floor condition, exercise area	−0.5–1.5
	well-being	Alpine pasture/pasture	0–1.0
IV. Stable climate	Permanent contact,	Light	−0.5–2.0
(light, ventilation, noise)	Important effects on	Air quality	−0.5–1.5
	behaviour,	Draughts within lying area	−0.5–1.0
	hygiene,	Technical noise	−0.5–1.0
	health and	Days outside/year	0–2.0
	well-being	Hours outside/day	0–2.0
V. Care of stockman	Correct and attentive	Cleanliness of housing	−0.5–1.0
(indicators)	care/handling of animals	State of technical equipment	−0.5–1.0
	has a balancing and	State of coat of hair	−0.5–1.0
	compensating effect on	Cleanliness of animals	−0.5–0.5
	behaviour, hygiene,	State of hooves	−0.5–1.5
	health and	Technopathies[a]	−0.5–1.5
	well-being	Animal health	−0.5–1.5
Sum of points	(max. absolute = 36.5)	= ANI-value =	−9.0 − 45.5[b]

[a] Technopathies are damage and injuries to the animals that are caused either directly or indirectly by the construction and technical structures and installations of the housing system.

[b] Max. column sum of points differs from overall sum, because loose housing and tied housing are mutually exclusive.

were allowed without an exactly defined justification. This practice was contrary to EEC-regulation 2092/91 and had to be abolished after joining the EU. The large variety of very different local situations at farm level made a more flexible and yet clearly fixed assessment tool necessary. Therefore, the Austrian Commission on Codex Alimentarius, at the Federal Ministry of Health and Consumer Protection, changed the standards for organic animal production in 1995 to the system of ANI-35-L and established official minimum thresholds: 21 ANI-points (in cattle ANI-35-L/1996 about 55% of the range of points = fairly suitable for welfare) must be achieved for existing stables and more than 24 ANI-points for new or reconstructed animal houses (more than 60% of the range of points = suitable for welfare).

A private firm owned by four animal-protection organisations has been controlling egg production under private law for large commercial enterprises on the basis of the ANI since 1995. According to the regulations of this firm, and of another animal-protection organisations controlling farms, at least 21 ANI-points (fairly suitable) must be achieved in layer housing without outside exercise and more than 28 ANI-points (very suitable for welfare) in free range systems. These are standards far beyond the

minimum requirements set by EEC egg-marketing legislation (regulation Nr. 1274/91 EEC).

4. ANI and animal-protection legislation

According to the constitution of Austria, animal welfare legislation is a matter for the nine federal provinces. The Salzburg Agricultural Animal Welfare Act (Salzburger Nutztierschutzgesetz, 1997) integrates the idea of the ANI within several paragraphs, establishing a general minimum standard of welfare expressed by an ANI-threshold, defining higher levels of welfare for the public support of investments into animal housing and providing a higher general standard of animal welfare for existing buildings that do not fulfil certain requirements regulated by the law. Defined ANIs have to be issued by government regulation, which is in preparation for 1999.

In § 6 of the Animal Welfare Regulation according to the Animal Welfare Act of Tirol (Tiroler Tierhaltungsverordnung, 1997), the ANI with its five fields of influence is used in a more simple form (five steps in each field are defined in an annex). The lack of fulfilment of legal requirements in one field can be compensated by better conditions within another field.

5. Investigation of the extent of application and judgement of applicability

5.1. Method

The extent of ANI-application and satisfaction with the system in Austria were investigated by sending a questionnaire in March 1997 to all firms that were officially authorized to check organic farms and to the animal-welfare organisations doing so under contract law. Questions, among other things, were about the kinds of ANI-35-L-systems used (animal species), the numbers of stables examined in 1996 and the average number of animals per housing unit, the distribution of welfare categories (ANI-values), the expected number of controls in 1997, the number of people included actively in checking in 1996 and in 1997, the time needed to do the ANI assessment at farm level and general verbal comments on the assessment system of the ANI. Furthermore, the question "how do you rate the ANI-system in respect of practical applicability, the effort of controlling, the representation of the animal-welfare situation and the standard of comparison of ANI values diagnosed by different examiners?" should be answered by Austrian school grades (0 = don't know, 1 = very good, 2 = good, 3 = satisfactory, 4 = sufficient, 5 = not sufficient). All 11 firms working with the ANI sent back the completed questionnaire, but not all firms answered every question. Quantitative answers were evaluated descriptively. For answers concerning the judgement of the ANI, mean values of given grades were calculated. In a second evaluation, the answers were weighted by the number of stables checked by the firms in order to take into account the different degrees of experience. The weighting method used is expressed by Eq. (1).

$$g_w = \sum [(g_i * n_i) \div \sum n_i] \quad (1)$$

with g_w = weighted mean of gradings; g_i = grade given by firm i; n_i = number of stables evaluated by firm i; i = number of firms from 1 to 11.

5.2. Results

Table 2 shows an extract from the data collected as an example for the distribution of firms and animal houses checked. Table 3 gives information about the number of animal houses controlled by the firms in 1996 and the expected numbers for 1997, as estimated by the firms. In 1996, the first year of broad application, 13,085 animal houses were ANI-controlled (91.5% are cattle houses). It was estimated that, in 1997, about 8200 stables would be checked again, some of which could not meet the thresholds at the first visit. So, by the end of 1997, it was expected that the majority of the 19,433 organic farms in Austria (Schneeberger et al., 1997) would have been checked. In 1996, 176 people were working with the ANI. For 1997, this number was estimated to be about 152. Time needed to collect data and determine the ANI-value for one animal house or husbandry system was estimated to be between 30 and 90 min (mean = 43.6 min) for the first check and 10 to 35 min (mean = 22.0 min) for

Table 2
Distribution of firms, animal houses examined in 1996 and judgment of practicability of ANI for cattle

Firm no.	Number of houses examined for				Grading of practicability of ANI for cattle			
	Cattle	Calves	Hens	Pigs	Applicability	Effort of control	Repr. of welfare	Comparability
1	19	19	1	0	2	3	2	0
2	0	0	354	0	0	0	0	0
3	2794	0	0	0	2	2	3	2
4	1	0	0	0	2	3	2	3
5	0	0	300	0	0	0	0	0
6	8	0	0	0	1	2	1	0
7	2777	0	0	0	2	2.7	2.2	1.8
8	22	0	0	0	1	2	2	2
9	350	0	0	0	2	3	2	3
10	3000	200	0	20	2	1	4	2
11	3000	200	0	20	2	1	4	1
Sum	11 971	419	655	40				
Mean					1.8	2.2	2.5	2.11
Weighted mean					2.0	1.7	3.3	1.7

Table 3
Number of stables evaluated by ANI and firms controlling 1996 and 1997 (estimated)

Production system	1996		1997 (estimated by firms)	
	Stables controlled	Number of firms	Stables controlled	Number of firms
Cows, cattle	11.971	9	4.653	8
Calves	419	3	1.739	7
Pigs	40	2	859	3
Laying hens	655	3	917	5
Sum	13.085	11	8.168	11

repeated checks on the same farm, when explanations to the stockman and measurements were no longer necessary. Of the farms, 5.5% of all farms were graded at less than 21 ANI-points (little suitable with respect to welfare), 60.5% of animal houses achieved 21 to 24 points (fairly suitable), 27.0% achieved more than 24 to 28 points (suitable) and 7.0% achieved more than 28 ANI-points (very suitable with respect to welfare). Thus, exactly two thirds (5.5+60.5%=66.0%) of all livestock housing at organic or animal-welfare farms were evaluated as being only little or fairly suitable concerning animal welfare.

Fig. 1 shows the results of judging the practical applicability, the effort of checking, the representation of the animal-welfare situation and the comparability of ANI, with answers weighted by the number of stables examined by the firms according to Eq. (1).

Apart from the results with ANI-pigs, this sample (two firms and 40 stables) was extremely small, however, the answers yielded good-to-satisfactory gradings for all questions asked. Only the representation of the welfare situation was rated approximately one grade worse (between 3=satisfactory and 4=sufficient), except with houses for laying hens, where rating was equally good.

5.3. Discussion of results

Although the real sample size (n) in the data analysis is only two to nine firms, the results do have practical importance. The extent of the application is considerable and the firms expressed general content-

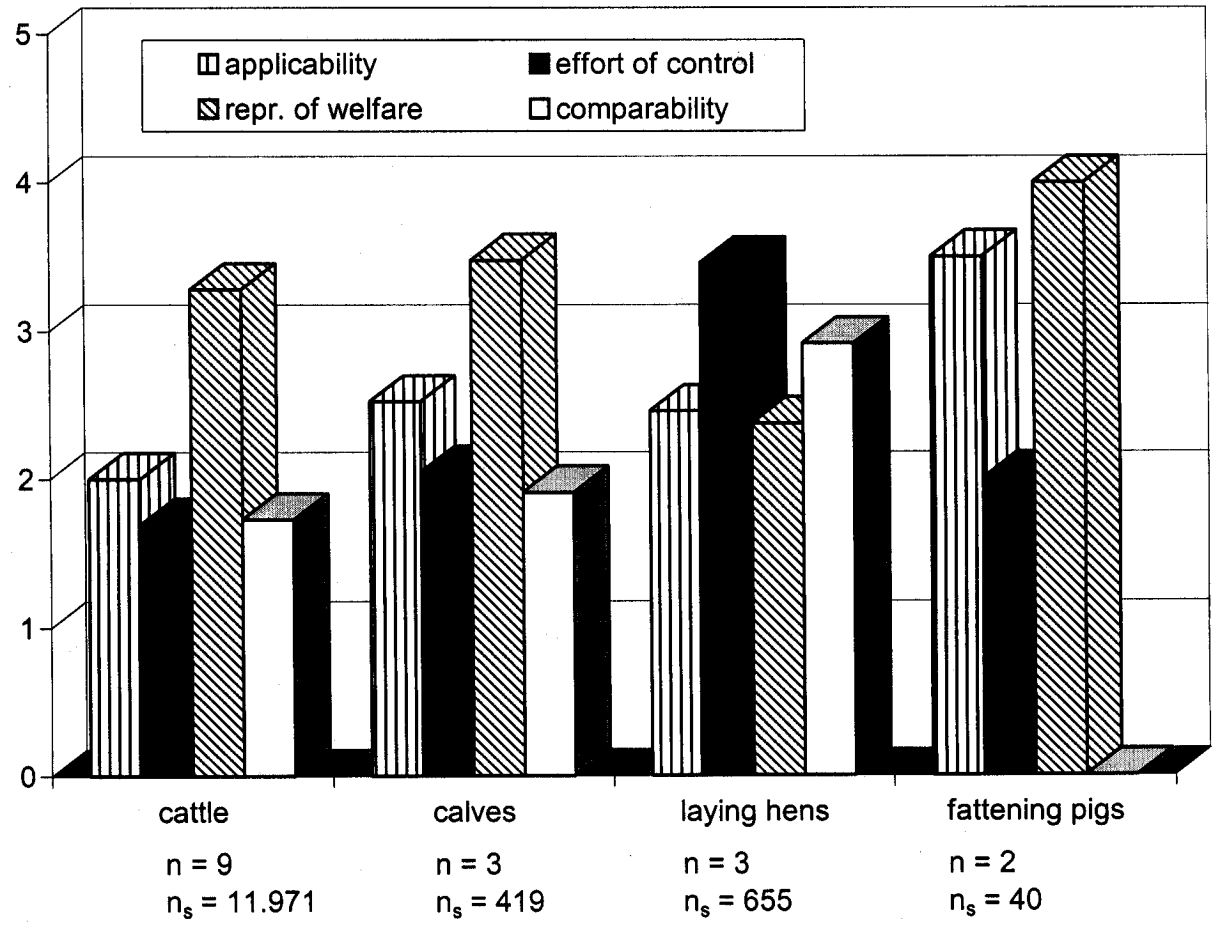

Fig. 1. Grading of ANI (TGI-35L) by 11 controlling firms with respect to practical applicability, effort of controlling, representation of animal's welfare situation and standard of comparison of ANI values diagnosed by different examiners; n = number of firms; n_s = number of stables examined in 1996; (1 = very good, 2 = good, 3 = satisfactory, 4 = sufficient, 5 = not sufficient).

ment with the practicability of the ANI. However, it is necessary to give reasonable explanations for the rather poor grades depicting the situation of animal welfare. One major reason is the fact that the checklists of essential minimum requirements, i.e. sine-qua-non conditions for issuing an ANI-value without a proviso clause, were not completely worked out at the time of introduction of the system. So, in some cases, examiners who were unconvinced felt obliged to give rather good ANI grades to farms that, to some extent, had poor housing conditions that should have been detected as a violation of minimum requirements. When the issue of those lists has been achieved, that problem should be resolved. The list for cows in tying stalls, the one which was most urgently needed, was completed in September 1997 and distributed to the controlling organisations in January 1998.

Another reason is based on the history of the regulations for organic farming in Austria, as indicated above. Before 1995, animal houses were controlled on the basis of checklists that included compulsory periodical outside exercise for all animals, including in winter. Summarizing several very good ethological and/or physiological conditions within the stables for the animals according to the ANI criteria (plenty of space; stable animal groups; optimal flooring; bright housing with good air; good

stockmanship), the given thresholds now make it possible to meet defined standards even without offering additional outside exercise during wintertime. Controlling firms apparently believe that the new ANI standards are less protective for the animals. Ethological arguments seem to be more difficult to communicate. Keeping in mind that the 1996 sampling frequency of ANI welfare categories proved that 66.0% of all animal houses controlled were not up to the standards required for good or very good animal welfare, criticism of controlling personnel does not seem too comprehensible. Finally, as the structure of the index, including the selection of parameters and their weighting, cannot be justified by scientific research, the system is susceptible to political influence. In fact, such an intervention in the ANI for cattle happened within the first year after its official introduction. It became apparent at this time that many of the old tying houses for cows on organic farms in the high alps had outside exercise at pasture during the summer period, but none during the wintertime, because of steep slopes and very cold and rough climatic conditions and because of other restricting or poor conditions within the old stables. These animal houses could not get enough points with the ANI 1995. Intervention led to a slightly higher weighting of a few of the ANI-parameters that could be met more easily by the majority of existing farms (ANI 1996). This was an additional reason for a rather poor rating of animal welfare by two of the larger firms. To prevent later alterations of that kind, provisions must be met by including the public, the representatives of consumers and animal-protection organisations more intensively in the political control of issued regulations.

The good grading of the comparability of the ANI values diagnosed by different examiners was surprising at first. As two-thirds of the ANI criteria are to be rated by judgement, a certain variety of results was expected if the same stable was examined by several people. Evaluation of given remarks in the questionnaires shows strength of effort by all firms to get a good comparability. Amon et al. (1998) investigated the repeatability of ANI-35 values, i.e., the relative similarity of repeated observations (it varies between zero and one; Sachs, 1992). In an experiment covering six similar cattle houses and seven controlling persons from the same firm, assessing the housing conditions independently at the same time, the authors found a repeatability of the ANI-values of 0.8, which qualifies as being sufficiently accurate, so that a single record gives a usable result. Still, it seems necessary to continuously improve the repeatability. Amon et al. (1998) recommend intensifying the training of controlling personnel and defining complex criteria as exactly and in as much detail as possible.

6. Justification and general discussion of Austrian ANI-35-L

Appleby and Hughes (1997) realised that science cannot measure the overall welfare of animals because there is no single measure that eliminates value-related disagreements. However, according to Dawkins (1980, 1982), Baldwin et al. (1981), van Putten (1982), Broom (1993), Hurnik (1993), Gonyou (1994), Nicol (1994) and Fraser (1995), the extent to which husbandry systems take account of the needs of livestock can be established with the help of various complementary parameters, i.e., production characteristics (performance, yield), physiological indicators (endocrine changes, cardiovascular responses, neurochemical changes, immunosuppression), pathological indicators like morbidity and mortality, disease, lesions or damage to the integument (Ekesbo, 1973), ethological criteria such as abnormal behavioural patterns which show that the individual has difficulties coping with its environment and the results of environmental preference testing or of experiments designed to test the strength of an animal's motivation to achieve a reward or carry out a particular activity (both reviewed by Fraser et al., 1993). However, most of these indicators require expensive investigations by different disciplines or a high experimental effort and therefore are not suitable for practical control work at farm level.

In the past, several attempts were made to assess housing systems by points or gradings with respect to animal welfare, as Hörning (1998) reviews comprehensively. Some of them can only be used for comparing systems on a general basis but not at farm level. Others seem to make very high demands on

the handling and the qualification of the people assessing in practice. Most of the systems are restricted to one species or to one specific product from a species or even to a single housing system. Broom (1993) puts together several of the physiological, behavioural, pathological and production-related parameters mentioned above into a "welfare continuum". However, the author makes clear that we do not know how the parameters equate with each other. So, inevitably, the design of a practical assessment tool for animal welfare at farm level must primarily be the result of negotiation. However, the set of principles that illustrate the selection of the parameters has to be outlined and justified by as much scientific background as possible.

The five freedoms (FAWC, 1979), (1) freedom from thirst, hunger or malnutrition, (2) freedom from lack of appropriate comfort and shelter (i.e. freedom from thermal and physical discomfort; Webster, 1984), (3) freedom from or rapid diagnosis and treatment of pain, injury, parasites (i.e. freedom from injury and disease; Webster, 1984), (4) freedom to display most normal patterns of behaviour and (5) freedom from fear (and stress; Webster, 1984) could possibly provide a useful framework for evaluating existing management and housing systems. The rationale for selecting only a few parameters describing those freedoms is that several elements of them are indispensable conditions for economic and profitable production. Comprehensive maintenance of sufficient hygiene and health standards as well as avoidance of hunger and thirst are matters of economically sound stockmanship and, in principle, do not conflict with animal welfare. Therefore, the following priorities were pursued to restrict the fields of concern:

- selecting housing parameters clearly contrary to the major short-term economic interests of producers (concerning primarily the freedom to display most normal patterns of behaviour);
- selecting conditions of the housing system that are easy and quick to measure or to judge accurately at a single control visit by personnel with practical experience in livestock husbandry but not necessarily with academic qualifications;
- including situations that might cause harm to the animals on a long-term basis or that are not usually recognized easily by the farmer;
- taking into account to a reasonable extent the quality of human care that is assumed to be of major influence in the welfare of livestock.

The importance of the *possibility of mobility*, the first ANI field of influence, is not only derived from the Brambell Committee Report's "little" freedoms (Brambell, 1965), mainly concerning the freedom of movement within a very restricted area (e.g. cage, crate, lying area), but also results from the fact that all species used in livestock production show a large variety of behavioural patterns of locomotion and, when kept on pasture or in semi-natural environments, farm animals move across large planes (Porzig, 1969; Wood-Gush, 1971; Sambraus, 1978; Reinhardt, 1980; Fölsch and Vestergaard, 1981; Kiley-Worthington and de la Plain, 1983; Bogner and Grauvogl, 1984; Stolba and Wood-Gush, 1989; Wechsler et al., 1991; Konrad, 1995). Furthermore, several behavioural patterns of other ethological functions (e.g. any kind of activity, exploratory behaviour, social contacts, grooming, rooting, evasive behaviour, playing behaviour of young animals) evidently also need space and require an adequate possibility of movement (Sambraus, 1982; Müller, 1987). Finally, there is evidence that the lack of movement causes degeneration of muscles, sinews, bones, deformation of the skeleton (Pilaski, 1970; Lehmann, 1985; Wokac, 1989) and immunosuppression (Schole, 1982).

Social contact between members of the same species is an outstanding aspect of normal farm-animal behaviour (Porzig, 1969; Wood-Gush, 1971; Sambraus, 1978; Reinhardt, 1980; Fölsch and Vestergaard, 1981; Kiley-Worthington and de la Plain, 1983; Bogner and Grauvogl, 1984; Tschanz, 1985; von Loeper et al., 1987; Stolba and Wood-Gush, 1989; Wechsler et al., 1991; Phillips, 1993; Konrad, 1995). Husbandry systems isolating or strongly restricting farm animals by tethering or confining them in narrow cages or single crates are meeting more and more opposition or are being banned (Edwards, 1985; Baxter, 1986; von Loeper et al., 1987; Study Committee, 1992; Konrad, 1995; EC regulations: documents 91/630/EEC, 97/2/EC and 97/182/EC). Consequently, it was decided that the possibility of displaying normal social behaviour depending on housing and management conditions should be assessed as an essential element of wel-

fare. Avoiding social stress and aggression is again primarily a matter of spatial supply, the structure of pens and housing conditions as well as the species-specific size and composition of the herd or group.

Flooring is the third field of influence. It is without dispute that floors in lying and resting areas (for lying behaviour, nesting, perching), activity areas (e.g. for movement, rooting, dust bathing, scratching), passages, alleys, outside exercise yards and laying nests have great influence on an animal's health (claws, hooves, legs, joints, integument, injuries by slipping, etc.), their behaviour and well-being (Fölsch and Vestergaard, 1981; Martin, 1987; Müller, 1987; Horstmeyer and Vallbracht, 1990; Batz, 1990; Wechsler et al., 1991; Rist et al., 1992; Hörning and BAT, 1992; Fölsch et al., 1992; Wathes and Charles, 1994; CIGR, 1994; Konrad, 1995; Bodlak, 1996; Herrmann, 1997). It follows from cited literature that, in flooring, the specific needs of species must be met. For cattle, it is important that each animal is provided with a reasonably clean dry soft and resilient bed upon which it can lie and that all other floors on which the animals are walking, standing and carrying out other behavioural patterns while standing or moving offer sufficient slip resistance and safety from stumbling and provide properties that assure avoidance of excessive abrasion and sole and hoof wall injury. Pigs especially need insulated lying areas and flooring materials that are suitable for rooting and exploring. Poultry rest on perches, need litter for scratching and dust bathing and workable material of fine structure within laying nests.

Climatic conditions of the environment, including light and noise, are elements of the fourth field of influence of the ANI. Stockmens' awareness of the importance of climatic conditions seems to be very poor. Konrad (1992; data of 1988) investigated the structure of Austrian husbandry systems and found that 89.5% of all cattle houses, 79.1% of the pig houses and 84.6% of the stables for laying hens were without sufficient ventilation. In most installations of forced ventilation, including those in other countries, only a small subset of all the functions to be fullfilled were operative. Where they existed at all, control systems were mainly designed to maintain a predetermined temperature in the building, with little regard to other important conditions like internal humidity, dust or gaseous burden (Randall and Boon, 1994). Air quality is undoubtedly an important factor of a sound environment (Drummond et al., 1981; CIGR, 1984; Tielen, 1987; Hoy and Mehlhorn, 1987; Robertson et al., 1990; Robertson, 1991; Wathes, 1994; Urbain et al., 1994). Avoidance of draughts is recommended in order to prevent heat loss and cold stress that might lead to infections, especially for young animals like piglets (Close et al., 1981; Le Dividich and Herpin, 1994). Light affects the health, fertility and behaviour of livestock by its spectral composition, its luminosity (i.e. intensity) and its daily and seasonal rhythmical changes (Heusser, 1959; Cena, 1960; Krüger and Stephan, 1963; Hollwich and Dieckhues, 1967; Schwerdtfeger, 1977; Aschoff, 1982; Bünning, 1977; Penzlin, 1989;). Deficiency of normal light exposure causes harm to the eyes (Lauber et al., 1961), reduces fertility (Janeczek et al., 1985; Lahrmann and Plonait, 1985; Dorn et al., 1991) and alters the behaviour of the animals (Huber and Fölsch, 1985; Gibson, 1985). Noise has been demonstrated to induce a variety of physiological alterations in mammals, such as changes in the cardiovascular homeostasis and in the secretion of hormones (Algers et al., 1978; Borg, 1981). Algers and Jensen (1991) found that suckling piglets subjected to continuous loud fan noise (85 dB A) performed less teat stimulation and that the milk production of the sow was lower. The authors try to explain the findings as a result of the noise masking the gruntings of the sow and additionally reducing the hearing ability of the piglets, resulting in decreased massage before and after milk letdown together with a less synchronized transition from massaging to sucking. Vocalization seems to be an important part of normal behaviour in birds as well Bäumer (1964), Andrew (1964), Fullerton et al. (1970) and Huber and Fölsch (1978) described vocalization in poultry and the changes in acoustic behaviour as a function of environmental impacts.

The fifth field of influence selected is the quality or intensity of *stockman's care*. The relationship between animals and their handlers can greatly affect the responses of animals to a range of factors. The role of the stockperson has been studied intensively in livestock husbandry (reviewed by Hemsworth and Barnett, 1987 and by Waiblinger, 1996) and, to a lesser degree, in poultry husbandry (reviewed by Duncan, 1990). Regular and friendly contact with the handler not only increases the sociability of animals

(e.g. for calves, as described by Waterhouse, 1978) but significantly improves the immunological response and performance of even very short-living animals like broilers (Gross and Siegel, 1982). Comprehensive results about the cognitive abilities prove that the majority of intelligent behaviour shown by farm animals is dominated by learned associations, sometimes in response to remarkably subtle cues (Nicol, 1996). There can be no doubt that the stockman's behaviour plays a dominant part in the development of those cognitive abilities (Arzt and Birmelin, 1993). The problem of "measuring" the quality of human care is not really resolved yet. The indicators to be easily assessed by an examiner, visiting the animal house for about half an hour, do not really depict the quality of the human–animal relationship. Better parameters should be developed and examined.

The *point scores* all carry similar weighting on a numerical basis, however, considering the importance of movement not only for locomotion but also for social contact and other essential behavioural patterns, major emphasis was put on a stronger weighting of free movement. Some parameters were therefore not only assigned larger maximum ratings but were also included in other fields of influence. Besides this ethological priority, the basis for the range has historic and pragmatic reasons. At the beginning of the development, it was proposed to give each of the five fields of influence the same share in the overall value and to adequately grade usual practical husbandry systems with their assumed animal welfare standards within several steps somewhere in between the two extremes, i.e. very intensive litterless confinement situations on the one hand and extensive outdoor production on the other (Bartussek, 1988). The first rather simple ANI system was introduced into official execution of the animal protection law of Vorarlberg in the early 1990s (Schmid, 1992). This gave reason to keep new and more detailed ANI versions compatible to that of 1988 concerning the mean gradings of the most common housing systems. As, for example, it should be possible to assess confining cows all year in tying stalls provided with regular outdoor movement as fairly suitable in respect to welfare (ANI value = 21–24 points), pasture and/or exercise yards had to be weighted fairly heavily. On the other hand, it should also be possible, within the same assessment tool, to grade good conditions of loose housing without outside facilities as being suitable with respect to welfare. In this case, all the ratings depending on outdoor exercise are not applicable, so housing conditions that could be fullfilled only or more easily in loose housing had to get higher weightings. Thus, several relevant criteria got maximum ratings of up to 3.0 points. The final structure of the rating and weighting is, after all, a result of trial-and-error in pursuing the aim of having all possible husbandry systems for a species graded by one and the same assessment tool and to achieve a broad consensus about the ranking of specific housing situations achieved by it. Hörning (1997, 1998) reviewed all investigations that were carried out in testing the different ANI 35 systems. Corrections were proposed for several of them. The procedure to issue amendments should be put down clearly. In any case, alterations must be worked out carefully and with respect to the rights of persons who had submitted to the assessment system in the past.

7. Similar efforts

Several investigations were carried out into comparing the Austrian type (ANI 35 L) with the system proposed in Germany (ANI 200). The latter considers eight fields of influence (locomotion behaviour, feeding and drinking behaviour, social behaviour, resting behaviour, comfort behaviour, hygiene and animal handling). Even though the structures of both ANI systems, i.e., the types and numbers of the parameters included differ considerably, assessment results are astonishingly similar. Schatz et al. (1997) compared ANI 35 L and ANI 200 within the scope of a sensitivity analysis. Using models of dairy housing reference systems that were optimized in all details and functions with respect to animal welfare, the extent to which alternately inserted weak points were detected by the systems was investigated. The models contained all relevant criteria on animal welfare known from the literature, regardless of whether or not, in principle, they conflict with the economic success of the livestock owner. Both ANI systems noticed on average slightly more than half of them. Hörning (1997) assessed 61 dairy houses by

both ANI systems and found very similar gradings. When plotting the ANI values, expressed as a percentage of the whole range of points of both systems, a highly significant correlation of ranking was found ($r=0.87$).

8. Conclusion

The ANI 35 L has proved that it meets the major expectations of the users (controlling authorities). It is accepted by the major Austrian animal-protection organisations engaged in farm-animal welfare and also by the legislating authorities in Austria. Comparing the Austrian ANI 35 with the German ANI 200 gives similar grading results, even though the structures of both systems are quite different. This leads to the supposition that any kind of similar assessment tool could do a good job as long as the criteria considered primarily reflect animal needs. There is a need for further development, especially in finding better parameters to assess the human–animal relationship, however, the widespread introduction of such a development into practice hinders too rapid a change. Because of the demand for standardization of the production methods of proprietary products (animal-welfare products) within the EU, the ANI system should be discussed amongst the European authorities concerned. Its flexibility matches the extremely wide variety of practical situations at farm level throughout the member states better than the strict observance of each of numerous isolated housing characteristics.

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