

Implementation of the European legislation to protect farm animals: a case study on French inspections to find solutions to improve compliance

AC Lomellini-Dereclenne[†], M Miele[‡], L Mounier[†] and I Veissier^{*†}

[†] Université Clermont Auvergne, INRA, VetAgro Sup, UMR Herbivores, F63122 Saint-Genes-Champanelle, France

[‡] Cardiff School of Planning and Geography, Cardiff University, Cardiff CF10 3WA, UK

* Contact for correspondence and requests for reprints: isabelle.veissier@inra.fr

Abstract

In the European Union, at least 1% of farms are inspected every year and sanctions are applied to those that do not comply with the legislation on animal welfare. These on-farm inspections can result in measures to correct welfare problems detected. They can also highlight major risks that will require a focus of efforts and help prevent further non-compliances. Here, we analysed the reports from inspections of French cattle farms between 2010 and 2013 to check whether inspection stimulates improvement and to propose ways to improve how animal welfare legislation is implemented through the cross-compliance system. French inspectors use 32 items to assess overall compliance of farms inspected. We found that compliance improves on farms that are re-inspected but not in other farms (8% of severely non-compliant farms). Nine items do not influence the overall assessment whereas eight have a huge impact. The importance attributed to items varies from the first to the second visit to a farm. The major risks are absence of farm records, lack of basic care (practices or enclosures likely to harm animals, insufficient feeding) and inadequate skills (no veterinarian consulted, insufficient qualified staff). To improve compliance with EU animal welfare legislation and the efficiency of the inspection system, we suggest organising consultation between inspectors, ministry central services and welfare experts to: (i) refine the checklist and harmonise interpretations of item compliance; (ii) make sure all farmers are aware of the legislative requirements and the major risks of non-compliance; and (iii) define plans for a step-wise improvement of non-compliant farms.

Keywords: animal welfare, cattle, compliance, EU legislation, inspections, overall assessment

Introduction

A remote risk of undernutrition, modification of the human-animal relationship, urbanisation, intensification of farming conditions, progress in animal welfare science, and environmental degradation have made the use of farmed animals and ethical farming practices a focal issue (Broom 1991; Miele *et al* 2011; Baratay 2012). These concerns emerged in the EU in the 1960s and were prominent in European Commission Eurobarometers organised in 2005, 2007, 2015 (European Commission 2005, 2007, 2016) and are now seen as a worldwide issue (Kjærnes *et al* 2007; Bayvel *et al* 2012; You *et al* 2014).

The EU has addressed mounting citizen concern over the protection of farmed animals by attributing greater importance to animal welfare in primary law, moving it from a Protocol annexed to the Treaty of the Functioning of European Union (TFUE) to a specific article (Article 13) of the Treaty of Lisbon which came into force in 2009. Article 13 clearly recognises animals as sentient beings. Numerous pieces of legislation (secondary law) have been adopted to regulate the practices concerning farm animals. In accordance with Council of Europe conventions and recommen-

dations, EU member states have adopted European directives and regulations on the protection of animals on farms, in transport and at slaughter. In addition, the European Commission adopted two strategies on animal welfare, one covering the period 2006–2010 and the second covering 2012–2015, in which it stresses a policy to pursue efforts to stimulate improvements in animal welfare across Europe.

Despite this legislative arsenal from the European Union, the welfare of farm animals seems far from fully assured. Various media scandals initiated by non-governmental organisations specialising in animal protection have challenged public opinion on the effectiveness of the animal protection laws. Indeed, according to 2016 Eurobarometer figures, 82% of the 27,672 respondents believed that the welfare of farmed animals should be better protected than it is today (European Commission 2016). The European Commission's effectiveness in putting Article 13 into practice is also under challenge from the European Parliament which, in 2015, adopted a resolution (ie a motion voted by all European parliamentarians) urging the European Commission to fully implement Article 13 and adopt a new strategy on animal welfare (European

Parliament 2015). In its communication on the 2012–2015 strategy for animal welfare, the European Commission recognises that practical implementation of the legislation is not entirely satisfactory and that further legislation is useless without first properly enforcing the legislation already in place (European Commission 2012).

Since 2007, European farms have been subject to cross-compliance on animal welfare (Kuhn *et al* 2008). Member states are to inspect at least 1% of their farms, and any farmers who do not comply with minimum European requirements for animal welfare are to be sanctioned. Each year, member states report to the Commission on the results of these inspections. This cross-compliance process can help improve the compliance of member states in two ways. First, inspections serve to detect offences — on farms that are inspected — and can result in measures to correct these offences on the offender farms. Second, compliance monitoring can highlight major problems (in terms of seriousness and probability of occurrence in a population) that require a focus of efforts (raising awareness, proposing remedial solutions...) which, in turn, helps prevent non-compliance (Nitsch & Osterburg 2007).

Inspectors from the Food and Veterinary Office (FVO [an Office of the European Commission]) monitor how member states are implementing EU food policy. There are large variations in levels of farm compliance between EU member states: on the broiler chickens' Directive, for example, only 30% of farms in France are compliant versus 87% in Germany and 100% in Sweden, while on the Directive concerning the protection of pigs, compliance rates range from 68% in The Netherlands and 70% in France to 95% in Sweden and 100% in Poland and Slovakia. The EUWelNet project comparing results from eleven member states (France, Sweden, UK, Germany, The Netherlands, Italy, Spain, Romania, Slovakia and Poland) concluded that France scores poorly on compliance with EU legislation to protect farm animals compared to the other EU countries (Bock *et al* 2014).

Here, we set out to understand the difficulties with effective implementation of EU legislation to protect farm animals. We carried out a case study in France as it has apparent difficulties in reaching high levels of compliance. We analysed the reports from inspections of cattle farms. These inspections only cover cattle over six months of age. There is no specific national or European legislation for the protection of these animals, therefore the inspections are carried out under EC Directive 98/58 (European Commission 1998), which lays down general principles related to the care of animals — irrespective of species — stating that animals should receive adequate quality and quantity of water and feed, be housed in appropriate settings, receive due care, etc. As it does not set exact requirements (eg no precise quality or quantity of feed or minimum space allowance per animal is specified), the Directive leaves member states wide scope for interpretation. The checklist provided to inspectors to assess the compliance of cattle farms in France uses similar general

principles, therefore also leaving inspectors wide scope for interpretation. This wide scope for interpretation allowed us to investigate how inspectors form a general judgement of the compliance of a farm. The specific objectives of this study are: i) to check whether actual on-farm inspections are likely to stimulate improvements in farm compliance with EU legislation to protect animals; and ii) to propose ways to enable more efficient implementation of animal welfare legislation through the cross-compliance system.

Materials and methods

Animal welfare controls in France

In France, the controls for the protection of farm animals are supervised by the Ministry of Agriculture (MoA). Each year, at least 1% of farms are inspected. With a population of 223,000 cattle farms and 15.4 million cattle (excluding calves) on average, per year, between 2010 and 2013, this 1% represents 2,230 farms and 15,400 animals inspected each year (source: MoA, <http://agreste.agriculture.gouv.fr/> and Interbev, <http://www.interbev.fr>). The inspectors are veterinarians or assistants from the local authority representing the MoA. The farms to be visited are chosen following a risk analysis, taking into account, for example, the results of previous animal welfare or health inspections, the size of the farm (large farms are more likely to be visited), the fact that a farm has recently begun operating or large changes have been noticed (enlargement of the farm, new production), problems signalled by veterinarians or complaints from citizens. The sample of farms to be inspected is completed by farms chosen at random to achieve 1% in each department. MoA central services have developed checklists to be used on-farm and guidelines to help inspectors use these checklists (some can be found at <http://agriculture.gouv.fr/les-vade-mecum-dinspection>). The checklist and guidelines are species-specific. The checklist related to inspections on animal welfare in the bovine sector was elaborated from EC Directive 98/58 on the protection of animals kept for farming purposes, as there is no specific legislation for the welfare of cattle. The checklist includes 32 items covering six areas: housing, equipment, staff, management, resources, and documentation (Table 1).

On a given farm, each of the 32 items are to be checked and the results expressed as compliant, not compliant, not relevant, or not observed (if a specific problem means the item cannot be assessed). The guidelines provide indications on how to assess the items and on what makes compliance or non-compliance for each item (eg when a farm is to be considered non-compliant for inappropriate housing, insufficient lighting, under-qualified staff, etc). The guidelines also state cases where items will never be relevant or always compliant. Lighting cycle and intensity is only assessed when artificial lighting is used (implying that it is not relevant in the case of natural lighting). It is considered that cattle do not have predators and so cattle farms will always be compliant with the item 'protection against adverse weather and predators when outdoors'. Farms are considered compliant on the item 'farming practices

Table 1 Distribution of non-compliance among items. Only farms visited once are included in the analysis (n = 9,327).

Area	Item	% Farms		
		C ¹	NC ²	NR ³
Housing	Protection against adverse weather and predators when outdoors	78.70	2.30	19.00
	Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines	71.08	10.48	18.44
	Outside enclosures well delimited	76.87	3.64	19.49
	Building materials not harmful to animals	77.41	2.93	19.66
	Equipment and building materials easy to clean and disinfect	72.23	7.67	20.10
	No sharp edges likely to harm animals	76.45	3.37	20.18
	Soils allowing waste disposal	74.70	4.55	20.75
	Quality of ambient air (gases and dust)	80.91	1.66	17.43
	Temperature and humidity	79.58	1.30	19.12
	Intensity and cycle of daily lighting (if artificial lighting)	57.18	2.80	40.02
Equipment	Feeding and watering devices designed to avoid contamination	90.69	5.41	3.90
	Feeding and watering devices designed to avoid competition between animals	92.95	2.95	4.10
	Adequate functioning of feeding and watering devices	90.77	4.76	4.46
	Functioning of ventilation devices (if artificial ventilation is used)	4.33	0.02	95.65
	Functioning of the back-up ventilation system and system alarms (if artificial ventilation is used)	3.81	0.01	96.18
	Daily check of equipment	87.61	1.68	10.71
Staff	Knowledges and qualifications	95.39	3.09	1.53
	Adequate staff numbers	96.34	2.32	1.35
Management	Frequency of inspections of the animals	96.97	1.95	1.08
	Lighting suitable for animal inspections	83.99	0.88	15.13
	No mutilation (female castration or dehorning after four weeks of age without anaesthesia)	97.05	0.81	2.14
	Farming practices avoiding severe or long-lasting pain or harm	93.34	5.59	1.08
	If in use, tethering systems allowing basic behaviours	90.36	3.03	6.61
	Prompt treatment of ill or injured animals	85.04	4.84	10.12
	No ill or injured animals left without proper care	88.25	4.58	7.17
	Isolation of ill or injured animals	82.85	4.49	12.67
Resources	Consultation of a veterinarian when needed	87.82	4.25	7.92
	Quantity and quality of feeding	93.00	6.09	0.91
	Frequency of feeding	95.63	3.16	1.21
	Quantity, quality and frequency of watering	93.66	5.79	0.56
Documentation	Safety of drugs administered to animals (excluding prescriptions by a vet)	78.77	1.38	19.85
	Farm records compliant with legislation	64.84	24.21	10.95

¹ Compliant: the farm is compliant for this item;² Non-compliant: the farm is non-compliant for this item;³ Not relevant: this item is not relevant on that farm.

avoiding severe or lasting pain or harm' pending the determination of harmful practices and their assessment by scientific experts. Furthermore, only painful mutilations (female castration or dehorning) or administration of unsecure drugs at the time of the visit can lead to a non-compliance with these two items, so the vast majority of farms are expected to be compliant.

After having checked all items, the inspector issues an overall assessment of the farm, which is rated 'fully compliant', 'slightly non-compliant', 'moderately non-compliant', or 'severely non-compliant'. The guidelines do not specify how the conclusion shall be drawn from the evaluation of the 32 items, leaving it up to the inspector to judge the overall compliance of a farm.

In most cases, farms that are rated severely non-compliant get visited a second time, unless they get shut down soon after the first visit, in which case they cannot be revisited.

After each inspection, the inspectors send a report of the farm's results (the 32 items and the overall assessment) back to the MoA, which collects all such reports into a central database. For the purposes of this study, the French MoA granted INRA access to their database.

Data collection and analyses

We collated a total of 11,487 reports from inspections of French cattle farms between 2010 and 2013 and, after discarding 141 reports where at least one item was not observed, a final total of 11,346 reports were analysed, corresponding to 9,327 different farms visited once and 1,155 farms revisited twice or more.

All statistical analyses were performed using R software (R Core Team 2016). In order to avoid dependencies between variables, we analysed all reports from first visits of farms (regardless of whether farms would be visited only once or subsequently revisited) and separately analysed all the reports from farms that were visited twice.

A χ^2 test was used to analyse the distribution of the overall assessment among farms visited once and its change over years. A χ^2 test was also used to analyse the distribution of non-compliances at item level, in order to identify those items on which farms were more often non-compliant. For farms visited twice, a McNemar χ^2 test was used to compare the distribution of the overall assessment between the first and the second visit.

On first visits, a logistic regression was run to analyse the links between overall assessment and number of non-compliant items or non-compliances noted on specific items. To simplify the analyses, farms were classified as severely non-compliant versus not severely non-compliant ('fully compliant', 'slightly non-compliant', and 'moderately non-compliant'). In a first analysis, the explanatory variable was the number of items with which the farm is not compliant. A second analysis used 32 explanatory variables corresponding to the level of compliance of the farm for each item; again, to simplify the analysis, per-item level of

compliance was expressed as non-compliant versus different to non-compliant (compliant or not relevant). The odds ratio (OR) obtained for an item measures the risk of a farm being declared severely non-compliant if it fails to comply with that item — in other words, the importance that inspectors lend to that item. Then, to highlight major instances of non-compliance, we multiplied the OR obtained for an item by the percentage of farms that were non-compliant on that item.

To analyse whether inspectors lend the same importance to an item in the case of repeated visits, a similar logistic regression analysis was run separately on the first and the second visits. All items with a significant impact on the first or second visit were kept in the analysis.

Results

Overall assessment: changes over years and visits

At first visit, 60.6% of the farms were found fully compliant, 17.0% slightly non-compliant, 14.5% moderately non-compliant, and 7.91% severely non-compliant. These proportions did not change over years from 2010 to 2013 ($\chi^2 = 0.63$; $P > 0.05$) (Figure 1).

When farms were visited twice, there were observable improvements from first to second visit: 4.8% fewer farms were found severely non-compliant on the second visit compared to the first one. To estimate the size of the improvement, the four classes ('fully compliant', 'slightly non-compliant', 'moderately non-compliant', or 'severely non-compliant') were transformed into numbers (4, 3, 2, 1). A 0.23 improvement was observed from first to second visit (McNemar's $\chi^2 = 56.41$; $P < 0.001$), suggesting that a farm had a 23% chance of reaching the next best category on the second visit (Figure 1).

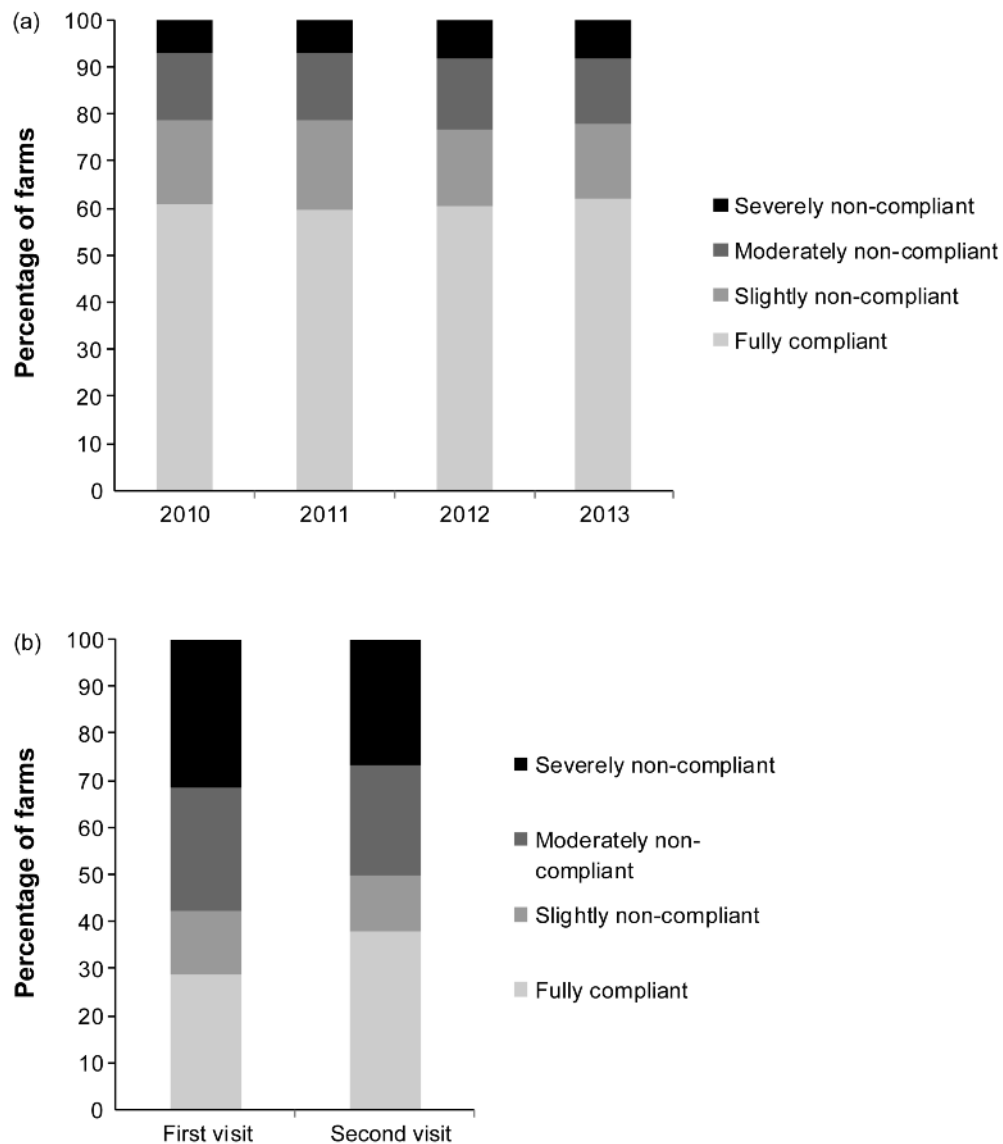
Assessment at item level

On the first visits, most items were fulfilled: 19 items were fulfilled on 80% of the farms and eleven items were fulfilled on 50 to 79% of the farms.

The non-compliances were not evenly distributed among items ($\chi^2 = 143,000$; $P < 0.001$) (Table 1). The items farms most often failed to comply with were: 'Farm records compliant with legislation' (24.2% of farms), 'Protection against adverse weather and predators when outdoors' (10.5% of farms), 'Equipment and building materials easy to clean and disinfect' (7.66% of farms), 'Quantity and quality of feeding' (6.09% of farms), 'Quantity, quality and frequency of watering' (5.9% of farms), 'Farming practices avoiding severe or long-lasting pain or harm' (5.6% of farms), 'Feeding and watering devices designed to avoid contamination' (5.4% of farms).

Some items were often considered not relevant, including the two items related to artificial ventilation ('Functioning of ventilation devices' and 'Functioning of the back-up ventilation system', not relevant in more than 95% of farms) and artificial lighting ('Intensity and cycle of lighting'; 40% of farms).

Figure 1



Distribution of the overall assessment of the farms over years and between two consecutive visits showing (a) trend over years at first visit (only farms visited once, $n = 9,327$) and (b) changes from first to second visit (only farms visited twice, $n = 1,155$).

Transition from checklisted items to overall assessment

Influence of number of item-level non-compliances on overall assessment

The number of items that a farm does not comply with had a significant impact on the overall assessment (logistic regression; $OR = 1.81$; $P < 0.001$). Half of farms that did not comply with seven or more items were declared severely non-compliant, and farms counting more than 20 item-level non-compliances were (nearly) always considered severely non-compliant. However, there were variations around this general trend: for instance, one farm that failed to comply with 18 items was nevertheless considered fully compliant and one farm that failed to comply with 30 items was considered only moderately non-compliant (rather than

severely non-compliant), whereas 86 farms that failed to comply with just one, 53 farms with only two or 54 farms with only three items were considered severely non-compliant (in most cases, these farms failed to comply with the 'Farm records compliant with legislation' item).

Items associated with overall assessment as 'severely non-compliant' (on first visit)

There were between-item variations in the impact of a non-compliance on a farm's overall assessment (logistic regression on first visits; Table 2). On first visits, nine items had no impact on overall assessment: 'Protection against adverse weather and predators when outdoors', 'Equipment and building materials easy to clean and disinfect', 'Quality of ambient air (gases and dust)', 'Functioning of ventilation devices (if artificial ventilation is used)', 'Functioning of the

Table 2 Impact of item-level compliances on the overall assessment of a farm (logistic regression). Only farms visited once are included in the analysis (n = 9,327). Following a step-wise procedure, nine items were not kept in the final model.

Area	Item	OR ¹	P ²	Risk ³
Housing	Protection against adverse weather and predators when outdoors			Not kept
	Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines	1.47	***	15.4
	Outside enclosures well delimited	2.64	***	9.6
	Building materials not harmful to animals	1.98	***	5.8
	Equipment and building materials easy to clean and disinfect			Not kept
	No sharp edges likely to harm animals	1.69	***	5.7
	Soils allowing waste disposal	1.65	***	7.5
	Quality of ambient air (gases and dust)			Not kept
	Temperature and humidity	0.35	***	–
	Intensity and cycle of daily lighting (if artificial lighting)	2.03	***	5.7
Equipment	Feeding and watering devices designed to avoid contamination	1.35	***	7.3
	Feeding and watering devices designed to avoid competition between animals	1.47	***	4.3
	Adequate functioning of feeding and watering devices	1.82	***	9.3
	Functioning of ventilation devices (if artificial ventilation is used)			Not kept
	Functioning of the back-up ventilation system and system alarms (if artificial ventilation is used)			Not kept
	Daily check of equipment	1.77	***	3.0
Staff	Knowledges and qualifications	3.81	***	11.8
	Adequate staff numbers			Not kept
Management	Frequency of inspections of the animals			Not kept
	Lighting suitable for animal inspections	1.73	ns	–
	No mutilation (female castration or dehorning after four weeks of age without anaesthesia)			Not kept
	Farming practices avoiding severe or long-lasting pain or harm	3.06	***	17.1
	If in use, tethering systems allowing basic behaviours			Not kept
	Prompt treatment of ill or injured animals	1.78	***	8.6
	No ill or injured animals left without proper care	1.78	***	8.2
	Isolation of ill or injured animals	1.68	***	7.5
Consultation of a veterinarian when needed	3.91	***	16.6	
Resources	Quantity and quality of feeding	2.54	***	15.5
	Frequency of feeding	2.6	***	8.2
	Quantity, quality and frequency of watering	1.82	***	10.5
	Safety of drugs administered to animals (excluding prescriptions by a vet)	0.48	ns	–
Documentation	Farm records compliant with legislation	4.17	***	101.0

¹ Odds ratio;² *** P < 0.001; ns, not significant;³ Risk = OR × % farms non-compliant at first visit (from Table 1). Calculated only when the OR is significant.

Table 3 Impact of item-level compliances on the overall assessment of a farm when visited for the first versus the second time (logistic regressions). Only farms visited twice are included in the analysis (n = 1,155). Only 13 items were significant on first or second visit and kept in the final models.

Area	Item	Visit 1		Visit 2	
		OR ¹	P ²	OR ¹	P ²
Housing	Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines	2.05	***	2.64	***
	Soils allowing waste disposal	1.55	***	1.46	ns
	Temperature and humidity	2.33	***	1.41	ns
Equipment	Feeding and watering devices designed to avoid contamination	0.63	***	2.35	**
	Adequate functioning of feeding and watering devices	2.13	***	0.93	*
Staff	Knowledges and qualifications	2.15	***	0.85	**
Management	Farming practices avoiding severe or long-lasting pain or harm	1.98	***	2.25	***
	Prompt treatment of ill or injured animals	3.87	***	1.98	***
	Isolation of ill or injured animals	2.40	***	2.00	***
	Consultation of a veterinarian when needed	3.89	***	2.47	***
Resources	Quantity and quality of feeding	4.07	***	5.13	***
	Safety of drugs administered to animals (excluding prescriptions by a vet)	2.81	***	0.23	ns
Documentation	Farm records compliant with legislation	2.40	***	2.00	***

¹ Odds ratio;

² *** P < 0.001; ns, not significant.

back-up ventilation system and system alarms (if artificial ventilation is used), 'Adequate staff numbers', 'Frequency of inspections of the animals', 'No mutilation (female castration or dehorning after four weeks of age without anaesthesia)', 'If in use, tethering systems allowing basic behaviours'.

The items most often associated with an overall assessment as 'severely non-compliant' were: 'Farm records compliant with legislation', 'Consultation of a veterinarian when needed', 'Knowledges and qualifications [of staff]', 'Farming practices avoiding severe or long-lasting pain or harm', 'Outside enclosures well delimited', 'Frequency of feeding', 'Quantity and quality of feeding', and 'Intensity and cycle of daily lighting (if artificial lighting is used)'. The OR of these items was above 2, meaning that a farm that registers non-compliance on each of these items is twice as likely to be found severely non-compliant than farms that comply with these items.

Changes in the importance of items when a farm is visited twice

On farms visited twice, 13 items had a significant impact on the overall assessment on the first or the second visit and were kept in the logistic regression. Their impact was not necessarily the same on the two visits (Table 3).

The OR of four items increased from the first to the second visit: 'Feeding and watering devices designed to avoiding

contamination' (the OR increased by 273% at second visit compared to the first), 'Knowledge and qualifications' (+172%), 'Outside enclosures clear of harmful objects, such as metal or plastic scraps or disused machines' (+29%), 'Quantity and quality of feeding' (+26%).

The OR of four other items decreased from first to second visit: 'Safety of drugs administered to animals (excluding prescriptions by a vet)' (-89%), 'Adequate functioning of feeding and watering devices' (-56%), 'Prompt treatment of ill or injured animals' (-49%), and 'Consultation of a veterinarian when needed' (-39%).

Identification of major risks

The most critical risk by far was 'Farm records compliant with legislation' (OR of this item at first visit multiplied by percentage of farms that do not comply with this item = risk of 101). Then, the items 'Farming practices avoiding severe or long-lasting pain or harm', 'Consultation of a veterinarian when needed', 'Quantity and quality of feeding', 'Outside enclosures clear of harmful objects such as metal or plastic scraps or disused machines', 'Knowledge and qualifications', 'Quantity, quality and frequency of watering' were associated to a risk between 10 and 20 (where 20 can correspond to an OR of 2 and 10% farms not complying).

Discussion

Our analysis of reports from official inspections of French farms between 2010 and 2013 found that a majority of farms were declared compliant with EU legislation to protect animals and that the proportion of fully compliant farms increased when farms were re-inspected. This analysis also enabled us to gain insight into how inspectors concluded as to whether a farm is compliant or not, and to propose ways to make the inspection process more effective in terms of improving the level of compliance across farms.

First of all, this analysis of inspections performed on French cattle farms revealed 60.6% of farms to be declared fully legislation-compliant when visited the first time, suggesting that these farms meet the basic standards for the welfare of their animals. In contrast, 7.9% of the farms were found severely non-compliant on their first visit. In the bovine sector, the level of compliance is lower in France than in other EU member states, such as the UK (more than 80% of farms were fully compliant in 2004), Denmark (77% of farms fully compliant in 2010), and Finland (72% of farms fully compliant in 2013) (DEFRA 2005; Danish Centre for Animal Welfare 2011; Finnish Centre for Animal Welfare 2013). Our results corroborate previous findings from the EUWelNet project (see *Introduction*) that France has apparent difficulties implementing European legislation to protect animal welfare. The poorer results obtained by France might come from the fact that the farms to be inspected are essentially chosen from a risk analysis and this may not be the case in all countries.

When the farms were re-inspected, compliance improved: severe non-compliances were still found but at a lower frequency, while the proportion of fully compliant farms increased. This improvement may result from a general trend in the farms' population due, for instance, to farmers being more concerned by the welfare of their animals or to wider societal pressure, or changes in farming models (Barkema *et al* 2015). However, no improvement was observed from 2010 to 2013 on farms visited once. Therefore, inspections *per se* are likely to have a positive effect on the level of animal protection on French cattle farms. Inspections are liable to make farmers more aware of requirements in terms of animal protection. However, only 1% farms get inspected each year and, on average, there was only a 23% chance that a farm would improve its compliance between two inspections. Therefore, inspections-driven improvement remains very slow at population level. As suggested by Anneberg *et al* (2013), efforts to raise awareness of all farmers on legislative requirements could stimulate improvements more quickly than only inspecting farms.

Even though the French MoA provides precise guidelines on how to inspect farms, it seems that inspectors do not strictly adhere to them. For instance, the guidelines specify that 'Protection against adverse weather and predators when outdoors' is to be considered not relevant on all cattle farms, yet inspectors considered this item as compliant on 79% of farms and not relevant in only 19% of farms. Likewise, the guidelines stipulate that farms shall always be found

compliant in relation to 'Farming practices avoiding severe or long-lasting pain or harm' (due to a lack of scientific evidence), yet 5% of farms were declared non-compliant on this item. The inspectors seem to use — at least to a degree — their own way to interpret what they see on farms before considering whether or not an item is fulfilled. It may be seen as a risk that farm inspections are not performed evenly between inspectors since some inspectors may follow the guidelines more strictly than others, but it could also be seen as a sign that inspectors endorse the inspection process.

Based on Lipsky's theory of street-level bureaucracy (1980), the apparent discrepancy between the rule and what is done in practice seems inevitable, as inspectors must confront and deal with the real world cases of the farms they inspect. This is further emphasised by the fact that the guidelines provided by the MoA do not make it clear how to form an assessment of the overall compliance of a farm from the results obtained at item level. According to the reports collated in the French national database, the more items a farm is found non-compliant with, the more likely an inspector will judge it severely non-compliant. However, this seemingly straightforward rule does have exceptions: some farms non-compliant on many items are, nevertheless, declared fully compliant overall. Hence, not only the quantity but also the nature of the items for which a farm is non-compliant seems to play a role.

Out of the 32 items on the inspection checklist, nine appear not to influence the assessment of the overall compliance of a farm. Three concern the barn ventilation ('Quality of ambient air [gases and dust]', 'Functioning of ventilation devices [if artificial ventilation is used]', 'Functioning of the back-up ventilation system and system alarms [if artificial ventilation is used]'). Most French cattle barns use natural air circulation via specific openings in the roof and walls, which negates the need for mechanical ventilation and means inspectors can consider indoor air quality as appropriate (even when high gas and dust concentrations are found in some farms). 'Protection against adverse weather or predators when animals are outdoors' also had no effect on overall assessment, although 2.3% of the farms were non-compliant on this item. Inspectors may consider that cattle can cope with such conditions without suffering. Similarly, inspectors appear not to use 'Adequate staff numbers' and 'Frequency of inspections of the animals' (both of which were noted in 2% of farms), 'If in use, tethering systems allowing basic behaviours' (noted in 3% of farms), and 'Equipment and building materials easy to clean and disinfect' (noted in 7.67% of farms) when formulating their overall assessment. These items probably need to be re-discussed between inspectors, MoA central services, and experts in animal welfare, in order to either refine their descriptions, define the importance inspectors are expected to attribute to a non-compliance in these areas, or even remove them if they are found to be irrelevant.

In contrast, some items have a huge impact on the assessment of the overall compliance of a farm. At first visits, the presence of farm records had the largest impact on inspec-

tors' assessment of overall compliance, as farms that do not keep records have approximately four times more chance of being declared severely non-compliant overall. Farm records are written accounts of mortality, occurrence of diseases, frequency of veterinarian visits, and all medical treatments administered to animals. They were absent on nearly one-quarter of the farms at first visit. Some farmers seem to disregard such paperwork, considering that it does not correspond to the normal work of the farmer which is more about caring for their animals than writing out accounts of what happens (Buller & Roe 2014; Escobar & Demeritt 2016). The readiness of the farmer to consult a veterinarian when needed and the farmer's own qualifications also have a big impact, again multiplying roughly four-fold the chances of the farm being declared severely non-compliant if they are not fulfilled. These two items relate to the skills necessary to taking good care of animals. Their impact on the overall assessment of compliance is in accordance with the importance attributed by both the EC and the French MoA to appropriate training (European Commission 2012; French Ministry of Agriculture 2016). Several items at least doubled the chances of a farm being declared severely non-compliant overall, and are related to the actual care that farmers provide their animals: practices avoiding pain or harm; outside enclosures clear of harmful objects; quantity, quality and frequency of feeding; and lighting of the barn. Other items were also found to negatively impact the overall assessment of the farm, albeit to a lesser extent, and are related to farm equipment (equipment or building materials that might be harmful, feeding and watering devices, daily check of equipment) or to the detection and care of ill or injured animals. There thus appears to be a gradient in the conditions perceived by inspectors as necessary to comply with the animal welfare legislation: from taking adequate account of what is done on-farm (most importance attributed), to having the adequate skills to protect animals, covering animals' basic requirements and, finally, (least importance attributed but still significant) limiting risks and providing adequate care to animals in poor health.

Surprisingly, some farms were declared severely non-compliant even though they failed to meet very few items of the checklist. Inspectors therefore likely used other criteria in addition to those on the checklist provided to them, at least on some farms.

The EFSA Panel on Animal Health and Welfare (AHAW) proposed to estimate the risks associated to a welfare problem by considering the consequence of the problem together with the exposure to the problem, ie probability of being affected (EFSA 2012). We transposed this reasoning by multiplying the OR linked to a farm's non-compliance with a given item (consequence of a non-compliance) by the proportion of farms that do not comply (exposure assessment). The absence of farm records was both the most important item for inspectors and the most frequent case of non-compliance, and is thus logically by far the highest risk. The next highest risks correspond to items related to the

care provided to animals by the farmer ('Farming practices avoiding severe or long-lasting pain or harm', 'Consultation of a veterinarian when needed', 'quantity and quality of feeding/watering', 'Outside enclosures clear of harmful objects [...]') and the skills of the farmer ('Knowledge and qualifications'). We propose that inspection visits should lend special focus to these items to make the inspection process more efficient. In addition, all farmers could be made aware of these risks of non-compliance beforehand to ensure improvements across years on all farms, regardless of whether or not farms are singled out for inspection.

The results presented above suggest that the inspection process would benefit from exchanges between field inspectors, the ministry in charge of the inspections, and experts in animal welfare in order to: (i) refine the inspection checklist by removing less-relevant items and focusing attention on those items that are considered especially relevant to on-farm animal protection checks, and possibly adding new items; and (ii) editing the guidelines to include recommendations on how to formulate the assessment of overall compliance of a farm. During the EUWelNet project, workshops and a web forum were organised to enable technical personnel from the competent authorities of several member states to exchange practices in checking the compliance of farms with the EU Directive to protect broilers (Manteca *et al* 2013). The feedback from the staff that participated in this initiative stated that it helped them identify the best ways to check the directive-related requirements. Such exchanges should at least be organised intra-member state to help inspectors in their daily work.

Our analyses found that when farms were re-visited, the importance attributed by inspectors to individual items changed from first to second visit. Some items that were important at first visit became even more important at the second. 'Quantity and quality of feeding' which already had a large impact at first visit, was found to have even more impact on the overall assessment of farm compliance at the second visit. Indeed, supplying feed is one of the basics of livestock farming and obviously essential to animals' lives. The farmer's 'Knowledge and qualifications' was also found to have more impact at second visit. Farmers have the possibility to follow free training sessions delivered by professional farmers' organisations, and the inspectors may consider that a farmer that fails to follow a training session despite receiving a warning after the inspection is showing signs of being unwilling to improve the situation. The 'Feeding and watering devices designed to avoid contamination' item, which had little impact at first visit, had a strong impact at the second one. Again, inspectors may consider that the farmer could have easily improved the standard of cleanliness of their feeding and watering devices at no additional cost. It therefore seems that at the second visit inspectors lend more importance to the feeding of the animals — an essential part of the care given by farmers to animals — and to changes that farmers could easily have made after the first visit, ie his/her willingness to improve the situation.

In contrast, some items were given less importance by inspectors at the second visit, ie ‘Safety of drugs administered to animals (excluding prescriptions by a veterinarian)’, ‘Consultation of a veterinarian when needed’, and ‘Adequate functioning of the feeding and watering devices’. The first two items do not relate to the everyday care that should be given to animals, while the third may be inherent to the design of the building equipment and therefore difficult for farmers to change in the time from first to second visit, which might explain why inspectors judge them less crucial. However, inspectors would have to be interviewed to learn precisely how they interpret these items.

The fact that inspectors change their way of reasoning from first to second visit to a farm prompts us to posit that a way to increase the efficiency of the inspection process, in terms of improving farm compliance, would be to issue farms declared severely non-compliant with a progress plan. The first step could be to better educate farmers (training) to help assure the basic needs of animals (feed and water) and correct what can be easily corrected (eg clean devices). Then, expectations could be progressively levered to bring farms up to full compliance. This kind of step-wise approach has already been recommended to improve the levels of farmed animal health and welfare (Webster 2009; Tremetsberger & Winckler 2015). Indeed, effective progression can be made by setting realistic objectives and regularly checking progress, then adjusting the plan according to results until reaching the ultimate goal of full compliance. In addition to controlling farm compliance, a facilitating process could be put in place to encourage farm improvement. The process could involve explaining the benefits of improving the situation, helping farmers to analyse their situation, or stimulating exchanges between farmers to analyse problems and propose solutions (Whay & Main 2015).

In conclusion, this study shows that the results of national inspections for the protection of farm animals can be used to help member states improve compliance with European legislation. More specifically, we suggest taking steps to:

- Make farmers aware of the requirements of the regulations and the major risks of non-compliance. In the case of French cattle farms, these risks are: absence of farm records, lack of basic care of animals (farming practices or untidy enclosures likely to cause harm or pain, insufficient feeding), and inadequate skills (no veterinarian consulted, under-qualified staff).
- Organise exchanges between ministry central services, field inspectors and animal welfare experts to refine the checklist to be used by inspectors and help them better interpret item compliance. After agreement is reached on the severity of dysfunctions that may be detected on-farm, the inspections could be focused upon what is viewed as a severe offence to animal welfare or what corresponds to a high risk.
- Define plans for a step-wise improvement of non-compliant farms. These plans should take into account the severity of dysfunctions (as estimated via the earlier exchanges between services) and the actual situation of a given farm.

In addition, more insight on inspector perceptions of the inspection method, eg through interviews, is needed to confirm our findings here on the way in which inspectors carry out their duties. Likewise, interviews with farmers should help clarify their knowledge and understanding of the legislation, and identify the barriers to change and potential drivers to improve compliance on EU legislation to protect farm animals.

Animal welfare implications

Compliance on legislation does not necessarily mean that animal welfare is fulfilled — indeed, the legislation contains only minimal requirements — but it is a pivotal basic step towards ensuring animal welfare. Compliance levels could be improved by taking action to raise farmers’ awareness of major compliance and welfare problems, refining the checklist and guidelines provided to inspectors (typically via co-operation between field inspectors, ministry central services in charge of animal protection and welfare experts), and proposing progress plans to farms that are struggling to comply with legislative requirements.

Acknowledgements

We thank the French ministry of Agriculture for granting INRA access to the database SIGAL. We are also grateful to Auvergne Traductions Techniques for checking and amending the English writing.

References

- Anneberg I, Vaarst M and Sandøe P** 2013 To inspect, to motivate, or to do both? A dilemma for on-farm inspection of animal welfare. *Animal Welfare* 22: 185-194. <https://doi.org/10.7120/09627286.22.2.185>
- Baratay E** 2012 *Point de vue animal: Une autre version de l'histoire*. Seuil: France
- Barkema HW, von Keyserlingk MAG, Kastelic JP, Lam TJGM, Luby C, Roy JP, LeBlanc SJ, Keefe GP and Kelton DF** 2015 Invited review: Changes in the dairy industry affecting dairy cattle health and welfare. *Journal of Dairy Science* 98: 7426-7445. <https://doi.org/10.3168/jds.2015-9377>.
- Bayvel ACD, Diesch DJ and Cross N** 2012 Animal welfare: A complex international public policy issue: economic, policy, societal, cultural and other drivers and constraints. A 20-year international perspective. *Animal Welfare* 21: 11-18. <https://doi.org/10.7120/096272812X13345905673485>
- Bock B, Hacking N and Miele M** 2014 Report on the main problem areas and their sensitivity to be addressed by knowledge transfer for each of the specific aspects of the legislation chosen for this project. *Deliverable 4 of the project Coordinated European Animal Welfare Network (EuWelNet)*. <http://www.euwelnet.eu/euwelnet/53423/5/0/80>
- Broom D** 1991 Animal welfare: concepts and measurement. *Journal of Animal Science* 69: 4167-4175. <https://doi.org/10.2527/1991.69104167x>
- Buller H and Roe E** 2014 Modifying and commodifying farm animal welfare: The economisation of layer chickens. *Journal of Rural Studies* 33: 141-149. <https://doi.org/10.1016/j.jrurstud.2013.01.005>

- Danish Centre for Animal Welfare** 2011 *Animal Welfare in Denmark 2010*. Ministry of Food, Agriculture and Fisheries, Danish Veterinary and Food Administration. https://www.foedevarestyrelsen.dk/english/Animal/AnimalWelfare/DCAW/Documents/13947_dyrevel_uk_web.pdf
- DEFRA** 2005 *Agriculture in the United Kingdom 2005: Department for Environment, Food and Rural Affairs*. DEFRA: London, UK
- EFSA Panel on Animal Health and Welfare (AHAW)** 2012 Scientific Opinion: Guidance on Risk Assessment for Animal Welfare. *EFSA Journal* 10: 29
- Escobar MP and Demeritt D** 2016 Paperwork and the Decoupling of Audit and Animal Welfare: The Challenges of Materiality for Better Regulation. *Environment and Planning C: Government and Policy*. <https://doi.org/10.1177/0263774X16646771>
- European Commission** 1998 Council Directive 98/58/EC of 20 July 1998 concerning the protection of animals kept for farming purposes. *CELEX-EUR Official Journal L221*: 23-27
- European Commission** 2005 *Special Eurobarometer 229 Attitudes of consumers towards the welfare of farmed animals*. http://ec.europa.eu/public_opinion/archives/ebs/ebs_229_en.pdf
- European Commission** 2007 *Special Eurobarometer 270 Attitudes of EU Citizens Towards Animal Welfare*. http://ec.europa.eu/public_opinion/archives/ebs/ebs_270_en.pdf
- European Commission** 2012 *Communication from the Commission to the European Parliament, the Council and the European Economic and Social Committee on the European Union Strategy for the Protection and Welfare of Animals 2012-2015*. https://ec.europa.eu/food/sites/food/files/animals/docs/aw_eu_strategy_19012012_en.pdf
- European Commission** 2016 *Special Eurobarometer 442 Attitudes of Europeans towards Animal Welfare*. <http://ec.europa.eu/COMMFrontOffice/publicopinion/index.cfm/Survey/getSurveyDetail/instruments/SPECIAL/surveyKy/2096>
- European Parliament** 2015 B8-1281/2015, *European Parliament resolution on a new animal welfare strategy for 2016-2020*, (2015/2957[RSP]). http://literatur.ti.bund.de/digbib_extern/dk039546.pdf
- Finnish Centre for Animal Welfare** 2013 *Animal welfare in Finland, a national report on animal welfare*. <http://elaintenhyvinvointikeskus.edublogs.org/files/2012/02/Animal-Welfare-Report-11z5o7w.pdf>
- French Ministry of Agriculture** 2016 *Stratégie française pour le bien-être animal 2016-2020*. http://agriculture.gouv.fr/sites/minagri/files/160627_ani_bea_strategie.pdf
- Kjaernes U, Miele M and Roex J** 2007 *Attitudes of Consumers, Retailers and Producers to Animal Welfare*. Welfare Quality Reports, Cardiff University: Cardiff, UK
- Kuhn G, Pyczak T, Sievert H and Häring G** 2008 Implementation of cross-compliance in the area of animal welfare. *Deutsche Tierärztliche Wochenschrift* 115(3): 89-92
- Lipsky M** 1980 *Street-Level Bureaucracy: Dilemmas of the Individual in Public Services*. Russell Sage Foundation: New York, USA
- Manteca X, Butterworth A, Main D and Velarde A** 2013 Report presenting the rationale of the undertaken strategies for knowledge transfer and the results of their implementation, including the reasons for success or failures. <http://www.euwelnet.eu/euwelnet/53423/5/0/80>
- Miele M, Veissier I, Evans A and Botreau R** 2011 Animal welfare: Establishing a dialogue between science and society. *Animal Welfare* 20: 103-117
- Nitsch H and Osterburg B** 2007 Efficiency of cross compliance controls – public administrative costs and targeting Deliverable 18 of the CC Network Project, SSPE-CT-2005-022727. http://literatur.ti.bund.de/digbib_extern/dk039546.pdf
- R Core Team** 2016 *R: A language and environment for statistical computing*. R Foundation for Statistical Computing: Vienna, Austria. <http://www.R-project.org/>
- Tremetsberger L and Winckler C** 2015 Effectiveness of animal health and welfare planning in dairy herds: a review. *Animal Welfare* 24: 55-67. <https://doi.org/10.7120/09627286.24.1.055>
- Webster AJF** 2009 The Virtuous Bicycle: a delivery vehicle for improved farm animal welfare. *Animal Welfare* 18: 141-147
- Whay HR and Main DCJ** 2015 Improving animal care and welfare: Practical approaches for achieving change. In: Grandin T (ed) *Improving Animal Welfare: A Practical Approach, Second Edition* pp 291-312. CAB International: Wallingford, UK
- You X, Yibo L, Min Z, Huoqi Y and Ruqian Z** 2014 A survey of chinese citizens' perceptions on farm animal welfare. *PLoS ONE* 9: e109177. <https://doi.org/10.1371/journal.pone.0109177>