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# Survey on animal welfare in 943 Italian dairy farms

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**Abstract**

The final results of a survey on welfare of dairy cows in 7 Italian Regions are presented. The study has been performed on 943 farms in southern and central Italy to highlight critical and strong points concerning animal welfare in dairy systems, by using direct and indirect criteria. To assess animal welfare, a check-list based on 303 parameters has been used; indirect criteria have been organized in 5 general areas concerning "Farm management", "Farming and housing systems", "Environment", "Feeding", "Health and hygiene"; other resource-based criteria were considered in 5 specific areasfor the different productive categories (lactating cows, dry cows, pregnant heifers, cows comeback, calves up to 8 weeks and calves between 8 weeks and 6 months); finally, an "Indicators" section focusedon animal based criteria. Parameters have been valued as "conforming" or "not conforming" on the basis of the current lesgislation on animal welfare, and in the other cases by the use of a semi-quantitative scale such as "poor", "satisfactory", "good" or "very good", referring to scientific literature and reports by the European Food Safety Authority (EFSA) Animal Health and Animal Welfare (AHAW) panel.

Among the 249 examined parameters (54 criteria have been valued as "descriptive"), 15 showed a failure prevalence inferior to 1%; for the remaining parameters, the overall non-compliance prevalence on the whole sample ranged from a maximum of 67% to a minimum of 2%, showing an inverse proportionality correlation with the herd size. 110 parameters were judged as "poor" (96) or "not in compliance" with the rules in force (14) in more than 10% of the examined herds. The most common non-compliance aspects detected in the different areas concern calves management, staff training and prophylaxis programs; staff training levels were inversely related to failure prevalences in almost all areas.

The combination of direct and indirect criteria has allowed to fully embrace recommendations on the use of animal based measures for the assessment of animal welfare, as accepted into the strategic Plan for the EU animal welfare for 2012-2015.

**Introduction**

Forty years after the enactment of the Strasbourg Convention on the protection of animals kept for farming purposes in 1976, animal welfare has increasingly established itself as a major issue in the context of economic policy and international trade and as a topic of great interest for consumers, which demand more and more respect for the protection of animals on the entire production chain. Furthermore, there is a known strong correlation between animal welfare and health and hygiene of livestock production: good welfare is, indeed, considered essential to maintain a high health state of the animals and, thus, to ensure healthy products and safe food. The rules in force in the European Union concerning food safety reassert how animal welfare is an essential condition to meet in current food legislation. In 2003, due to the reform of the Common Agricultural Policy (CAP), animal welfare has become an essential requisite that farmers must respect to obtain support and agricultural incentives. In addition, as part of the CAP, the Rural Development Program provides incentives for breeders who perform improvement going over the minimum requirements set by the rules.

EU has established a broad normative framework for the protection of farm animals along the entire production process, from breeding to slaughter. The current legislation, derivative from a dated conception, still focuses on the evaluation of several factors (structures, environment and management) able to influence animal welfare, but does not include measurements directly applicable to the animals. An example of welfare assessment system mainly focusing on housing systems and management is the Animal Needs Index (ANI), a system 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. ANI is used officially in Austria, mainly in controlling organic farming in connection with animal welfare legislation and consists in a scoring leading to a sum of points concerning the housing system (Bartussek, 1999). Resource-based assessment can fail to fully answer questions about animal welfare; for

this reason, there is an increasing interest in developing animal-based methods that can be used to estimate the actual state of welfare of the animals (Webster, 2009). Scientifically validated indicators based on animals have been recently included in the strategic EU plan of 2012 – 2015 to make a more effective evaluation of the animals' well-being. The use of outcome-based animal welfare indicators is now also recognized at international level by organizations such as the World Organization for Animal Health (OIE); for dairy cows, for example, they include an assessment on the prevalence and severity of lameness, mastitis, collision with facilities in laying down and getting up, poor physical conditions etc. This approach has been recently implemented also by the EFSA AHAW panel, which published a scientific opinion on the use of these parameters based on animals for the evaluation of dairy cows welfare (EFSA, 2012). At the Danish Institute of Agricultural Science, a welfare assessment protocol integrating behavioural measures and clinical observations with information on the housing system and management routines has been developed in Automatic Milking Systems herds (Sørensen *et al.*, 2001).

On the contrary, other surveys have been conducted, above all, on clinical observations (Huxley *et al.*, 2004); for example Whay *et al.* (2003) have taken into account nutrition, reproduction, disease, external appearance, environmental injury and behaviour of dairy cows measured on 53 UK dairy farms, while Roche *et al.* (2009) have been evaluated the Body Condition Score (BCS) and its association with dairy cow productivity, health and welfare. Main *et al.* (2003) employed a welfare assessment of the cows' welfare protocol based on observations of the behaviour and physical condition of the adult dairy cattle, an evaluation of each farms' medicines records and an estimation of the level of production and incidence of disease obtained by interviews and questionnaires.

In the current bibliography, there are only few studies taking into account several parameters both on animal and on housing/management systems; in North America, von Keyserlingk *et al.* (2012) have carried out a study on lameness, leg injuries, lying behavior, facility design and management practices for high-producing cows on freestall dairy farms in 3 regions of North America. Vasseur *et al.* (2010) developed an advisory tool assessing 10 critical areas of calf and heifer management, including calving management, care to newborn calves and painful procedures, colostrum management, cow-calf separation, calf feeding, weaning, calf housing, heifer feeding, heifer housing and general monitoring, each of them validated by a panel of experts. In Netherlands, Derks *et al.* (2013) have performed a survey using a Veterinary Herd Health Management (VHHM), a questionnaire based on information concerning a combination of animal health, milk production, disease prevention placed in a framework of farm economics, welfare, food safety and environment.

The aim of this investigation was to evaluate the conditions of animal welfare in a broad sample of Italian dairy cattle herds, through the collection of informations recorded in the farms and the filling out of appropriate forms through which it was possible to assign scores to the different functional areas, both general and specific for the various productive categories of animals. In order to allow an assessment of well-being based not only on the minimum criteria set by the current legislation, but also including other aspects of sure impact on animals, the check-lists we employed included both indirect parameters ("resource-based"), aimed at assessing the structures, breeding environment and management procedures, and direct parameters ("animal-based"), suitable to analyze and measure the effect of farming conditionns on animal welfare.

**Materials and Methods**

The present survey has been conducted between 2006 and 2012 in 943 dairy cows farms located in seven Italian regions in southern and central Italy: Sicily (183), Basilicata (51), Calabria (138), Apulia (177), Sardinia (243), Lazio (23) and Emilia-Romagna (126); most of the examined farming systems (84%) were free-stall.

The methods and the working tools used here were based on those employed in a previous study conducted in 126 farms in Emilia Romagna (Peli *et al.*, 2007). Specially trained technicians have carried out inspections in the farms by filling a check-list including 303 parameters organized into five "general areas", five "specific areas" for different production categories (lactating cows, dry cows, pregnant heifers, cows comeback, calves up to 8 weeks and calves between 8 weeks and 6 months) in addition to a section called "Indicators".

In the "general areas" were considered indirect criteria relating to the following aspects: 1. Farm management; 2. Farming and housing systems; 3. Environment; 4. Feeding; 5. Health and hygiene. In the "specific areas" particular design-criteria were examined, related to the farming system, feeding, facilities and other resource-based criteria.

In addition, the "Indicators" section provides to consider several indices measured through the direct examination of the animal (animal-based criteria that include parameters related to health, cleanliness, physical integrity, behaviour of the animals).

When the parameter was assessed on the basis of the current rules on animal welfare, the evaluation of these observations has been expressed in terms of "compliance" or "not-compliance" to such rules; in the other cases, by the use of a semi-quantitative scale such as "poor", "satisfactory", "good" or "very good". For this last aspect we have referred to the knowledge available in the current scientific literature and, especially, in reports concerning the "risk assessment" carried out by the Scientific Veterinary Committee - Animal Welfare Section (SVC-AW) of the European Commission, until 2002 and, later, by the AHAW panel of the EFSA. On this basis, precise reference limits have been set for each parameter in a manual provided to evaluators. Items for which an objective assessment was not possible have been considered as "descriptive parameters" (54 parameters), useful for the characterization of the farms, but not taken into account for the final evaluation.

For each item, the percentage of "non-compliance" or "failure" has been determined, both for the entire sample of farms and for each Region enrolled. Furthermore, the size of the herd has been taken into account: farms have been classified in three groups, on the basis of the number of adult cows housed at the time of the inspection: we have identified as "small farms" the herds with less than 40 heads, "medium farms" the herds with 40-79 adult cows and "large farms" those with 80 or more head of cattle.

Among the collected parameters, only criteria showing a non compliance/failure prevalence higher than 10%, representing the most common critical aspects in Italian dairy cow farming, are discussed in this paper.

**Results**

943 farms were surveyed: they had an average size of 69 adult cows (min. 3 – max. 800), among which 56 in milking with a productivity of 7000 Kg of milk/year for each head; these farms belong to the High Quality Milk supply chain (Latte Alta Qualità) in 43% of cases, to the Organic supply chain (BIO) in 1%, in the Normal (N) in 50% and in other supply chains in 6% of cases.

In relation to the size, the sample accounted 44% (n=419) of small-scale farms, 28% (n=267) of medium size farms and 28% (n=257) of large-scale farms.

For 15 criteria out of 249 (54 "descriptive" parameters have not been examined), non-compliance/not satisfactory judgements were given to 1% or less of the examined farm sample; for the remaining parameters, the overall "failure" prevalence on the whole sample ranged from a maximum of 67% to a minimum of 2%. In particular, 110 parameters were judged as "poor" (96) or "not in compliance" with the rules in force (14) in more than 10% of the examined herds (Table 1).

The prevalence (pr) of those frequent non-compliance/not satisfactory judgements (pr>10%) clearly showed an inverse proportionality relation with the herd size; actually, a medium "failure" prevalence of 35% was detected on the whole farm sample for the most frequent (pr>10%) non compliances. The small-scale farms showed for the same criteria a

medium prevalence about 43%, the medium ones showed a medium prevalence of 34% and in the large farming systems the prevalence of the most common non compliances was about 22%.

The most common non-compliance aspects detected in the different areas concern calves management, staff training and prophylaxis programs.

***Farm management***

A good part of non-compliances recorded in this area concerned the management and housing of calves. Disbudding of calves should be carried out, in accordance with current legislation (Italian Legislative Decree 146/2001), within 21 days of age: on the whole herd sample a 14% medium percentage of non-compliance was detected (18% for the small herds, 14% for the medium and 7% for the large farms). According to Council Directive 2008/119/EC calves must not be tethered, with the exception of group-housed calves, which may be tethered for periods of not more than one hour at the time of feeding milk; in the examined sample, a medium prevalence of 11% was detected for this non conformity (21% in the small farms, 5% in the medium ones, 2% in the large ones).

Another important aspect concerns the respect of calves sociality: individual pens for calves, except those for isolating sick animals, must not have solid walls but perforated walls which allow the calves to have direct visual and tactile contact (Dir 2008/119/EC); in the 22% of the examined farms this compulsory requirement was not respected. Unexpectedly, this non-compliance showed a direct proportionality relation with the farm size, with a prevalence of about 9% in small herds, 15% in medium herds and 23% in the larger ones. The compulsory requirement of providing appropriate bedding for calves less than two weeks old was not respected in 14% of the farms, with an higher prevalence in large herds (16%) slightly decreasing with the farm dimension (13% in the medium farms, 12% in the smaller ones). Another fundamental compulsory aspect regarding calves nutrition is the necessity of providing with an appropriate diet adapted to their age and physiological needs; to this end, a minimum daily ration of fibrous food must be provided for each calf over 2 weeks old. This requirement was not satisfied in the calves management of 11% of the sample (13% of the small farms, 11% of the medium and 6% of the large ones).

The presence of a bovine colostrum bank has undoubting benefits for the immunity of calves, reducing deaths caused by failure of passive transfer and, all things considered, the costs of the farm. Indeed, this aspect isn't still much considered by Italian farmers; this survey underline the problem, considering a medium prevalence of "not-satisfactory" judgements in 65% of the enrolled farms, with a peak of almost 71% in the small dairy farms, and percentages of 63% and 56% in the medium and large ones.

The other frequent "not-satisfactory" judgements recorded in this area concern the staff training: although Council Directive 98/58/EC prescribes that *animals shall be cared for by a sufficient number of staff who possess the appropriate ability, knowledge and professional competence*, the survey highlights the general lack of training in the examined farm sample: in the 66% of the farms, stock person did not attend any training course on animal welfare in the last 2 years. This percentage was clearly higher in small farms (77%) than in medium (70%) and in large ones (43%). In the same way, among the staff, we didn't find personnel with specific training on milking (37%), partum management (46%), heat detecting (47%), drugs administration/sick animals assistance (57%), feeding (43%), applying of eartags (53%), animal handling and transport (42%). This deficiency is most noticeable in small and in the medium herds, while in the large herds these percentages decrease in all the examined Regions. As to feeding and nutrition, in 28% of the sample, farmers do not seek the advice of a professional nutritionist, above all in Calabrian and in Sicilian farms (for both above 50%); in about half of the smaller farms (47%) a feeding expert is never consulted, while the percentage is lower in medium (20%) and large farms (8%).

The frequency of tests on the drinking water (if not taken from public water supply) has been considered "poor" if performed once in intervals greater than two years: this judgement has been given to 24% of the farms; highest percentages of failure are detected in Sicily (82.0%), in Apulia (59.0%) and Basilicata (34.8%), 22% in Emilia-Romagna, 4,3% in Lazio, while only in 10.7% and 2.7% of farms in Sardinia and Calabria, respectively. The highest percentage of failure is detected in small and medium farms (28%), while better results (12%) are found in large ones.

Data concerning the presence of automatic fittings and facilities, their maintenance, the registration of current maintenance, the recourse to technical assistance are highlited in Table 2.

***Farming and housing system***

Among the structural characteristics examined in this area, one of the highest non-conformity prevalence has been detected on the housing system of the animals not kept in buildings (e.g. cows kept out to pasture in extensive production systems); an average prevalence of 63% has been found for the lack of structures that can protect animals from adverse weather conditions, predators and risk for their health (Directive 98/58/EC). Grazing systems are more common in central and southern Italy: the prevalence of this non-conformity reaches a percentage about 89% in Sicily, 42% in Sardinia and 37% in Apulia extensive systems. This legislative non-compliance is detected in 68%, 57% and 43% of the small, medium and large farms, respectively. Another peculiar problem of extensive breeding is the lack of the access to a suitable water supply: this condition is observed in 21% of the farms, with little difference between small and large ones, in which we detected percentages about 25% and 22%.

Other engineering criteria that received a "poor" judgement concern the fittings for securing animals, which do not have anti-suffocating systems in 58% of the farms; this deficiency is quite widespread in every Region in a percentage ranging between 82% for Sicily and 35% for Basilicata. In large farms those security systems are absent in 33% of cases, while in medium and small farms in 63% and in 70% farms, respectively. These structures were damaged or in poor conditions in 13% of cases (20% of the small farms, 15% of the medium and 7% of the large ones).

Another relevant aspect is the lack of pens for injured or sick animals; isolation of ill animals is, indeed, a very important practice in the herd management against the spreading of contagious diseases, and it's compulsory by law (Directive 98/58/EC). The lack of isolation structures for sick animals has been found in 15% of the farms, with a peak about 23% of the small systems, decreasing to 11% and 4% in the medium and large ones. Strictly related to this aspect is the lack of quarantine premises for new heads in entry; quarantine accommodations were not present in 13% of the examined farms; this kind of inadequacy is much less frequent in large farms (6%) than in small ones (20%).

Materials used for the construction of accommodations and pens should be capable of being thoroughly cleaned and disinfected; this compulsory requirement is not satisfied in 18% of the examined structures: that percentage was predictably higher in small farms (29%) than in large ones (7%). The same materials shall be constructed and maintained so that there are no sharp edges or protrusions likely to cause injury to the animals (Directive 98/58/EC): internal surfaces have been judged deteriorated and capable of causing injury in 12% of cases; internal surfaces of small farms tend to be more frequently deteriorated (19%) than in medium (9%) and large ones (3%).

In this area, other criteria worthy of note (due to the high percentages of failure or non-compliance) mainly concern some structures; for example, in 31% of the farms there is the undesirable presence of steps or barriers to the milking parlor entrance, with similar percentages with regard to the farm size. Two other negative parameters are the lack of corridors for exercise (18%) and a specific area for loading and unloading the animals (26%);

in both cases the lack presents a higher occurrence in smaller rather than in larger farms. 18% of the farms (30% of the small, 6% of the large ones) were not equipped with an electric generator to power the automated and mechanical equipment in case of blackout of the electrical system.

Calves housing was, also in this area, a critical aspect that shall be improved; in particular, dimensions of individual pens were judged inadequate (not conform) in 11% of the small farms, in 6% of the medium farms and in 4% of the larger farms. For calves kept in groups, the space available to each calf was not adequate to the law requirements in 13% of small farms, 6% of the medium and only in 2% of the large farms.

***Environment***

With regard to environmental microclimatic conditions, only in very few cases "poor" conditions have been detected; for example, only in 4% of the farms it was possible to perceive a strong smell of ammonia and excessive environmental dust was recorded in 8% of the farms (even if a significant gap is noticeable between small stables, with a prevalence of 14% and large systems, with a non-compliance prevalence about 2%). In the present area, on the contrary, are found mostly structural deficiencies as the absence of gap in the gable roof ridge, detectable in 47% of cases, at high percentages in all the enrolled Regions, but above all in Sicily (39%). Depending on the size of the farm, this structural defect is found in small and medium (62% and 47% respectively) rather than in larger farms (30%).

Based on the type of coverage of the building, the farms have received a "poor", "sufficient" or "good" judgment, depending on whether it was formed only by roof covering, by the roof with false ceiling, but without thermal insulation or with thermal insulation. Only roof covering is present in 64% of the structures, with small differences between large, medium and small ones.

In farms with natural ventilation, the presence and kind of systems for adjusting the air flow rate have been evaluated. The lack of systems regulating the air flow rate ("poor" judgment) has been registered in 57% of the farms. In almost all of the remaining farms, receiving a "sufficient" judgment, the regulation is only manual and not according to the temperature, relative humidity and/or wind.

Where ventilators are supplied, a high percentage of farms has been documented to lack an emergency automatic system providing an appropriate backup in the event of failure of the electric system: an average non-compliance prevalence about 66% has been calculated on the whole sample. Similar failure prevalence (67%) could be observed for the alarm system giving warning of the breakdown.

***Feeding***

Feeding in dairy cows farming is a crucial aspect, influencing milk production, health and welfare of the animals; for this reason it must be adjusted to the animals' physiological stage, on the basis of several criteria. This practice is not applied in 10% of the farms; also for this aspect the major deficiencies are recorded in the smaller farms (18%) than in medium (7%) and large (1%) ones.

The adjustment is made on the basis of one (sufficient) or more (good) criteria in 24% and 66% of the whole sample, respectively. In 91% of the large farms, feeding is adjusted on the basis of several criteria, while in the small and medium ones this regulation is applied in 48% and 68% of the farms, respectively.

***Hygiene and health***

In this area, including direct and indirect prophylaxis measures influencing animal welfare, the highest percentages of failure were reported. Control plans are some of the most important aspects that revealed non-compliances with good hygiene practices. For example, in

65% of the farms there's no control plan for parasites; this failure is unexpectedly found in similar percentages in small (65%), medium (68%) and large (64%) farms.

A control plan against mastitis is not applied on average in 37% of the farms; highest failure percentages have been recorded in Sicily (87%), followed by Apulia (65%), while in Sardinia, Emilia-Romagna, Calabria and Basilicata regions 90%, 87%, 89% and 71% of the farms, respectively, put in place mastitis control plans. Among the largest farms, 87% of them usually adopt prophylaxis measures against mastitis, but this value drops to 59% and 50% in medium and small farms, respectively.

Farms included in this survey also showed a fairly indicative deficiency in the fight against rodents (62%) and flies (43%); in both cases Sicily is characterized by the highest non-conformity percentages (99% and 93% of the farms, respectively) and Sardinia by the lower ones (14% and 5%, respectively). For both these parameters, the small farms showed the highest percentages of failure, namely 82% and 59%. For the medium farms these failures are recorded in 64% and 45% and for the large ones in 27% and 15% of cases.

When internal comeback is not exclusively used, it should be respected a quarantine period for new animals in entry; this good health practice is respected by approximately 82% of the whole farm sample, and in 93%, 80% and 73% of the large, medium and small farms, respectively.

In 61% of the farms a lack of appropriate vaccination programs or proper measures for the control of infectious diseases has been found; this deficiency, in percentage, ranges between 30% for Lazio and 84% for Sicily and, in all the Regions, is inversely proportional to the size of farms and variable between 32% in large farms and 81% in small ones.

Moreover, 43% of the examined farms do not turn to a programmed veterinary assistance; this is mainly observed in Sicily (83%) and in Apulia (82%) and to a lesser extent in Calabria (15%), Basilicata (12%) and Sardinia (3%). This is especially observed in small and medium farms (in 65% and 44% of farms, respectively) and in lower percentages in large ones (9%).

Foot care is routinely performed on average in 68% of the whole farm sample; as we observed for the other criteria, in large farms greater attention is given to this fundamental practice (non-compliance prevalence=4%), while higher failure percentages are registered in medium (30%) and small farms (50%). Footbathing, in particular, a preventative measure against the spreading of hoof problems, is practiced in about 42% of the farms and is a routine practice in 81% of the large farms , while high prevalences of non-compliance are observed in medium (53%) and small farms (83%).

Also in this area, we could detect a critical aspect concerning calves health/hygiene management: cleaning and disinfection of pens and boxes used for the accommodation of calves are not routinely practiced, with an average percentage of 11% non conformity; in large farming systems we could find a greater attention (4% non conformity) payed to this aspect than in small-scale ones (18% non conformity).

***Indicators***

This section includes outcome-based indicators for which judgments like "non-compliant" (or "unacceptable"), "acceptable" or "optimal" has been given.

In 12% of the examined farms, the Cow Cleaning Index has received an "unacceptable" judgement and above all in Apulia (50/177-28.2%) and Sicily (43/183-23.5%), while better results have been recorded in Emilia-Romagna and Lazio Regions, with a non-compliance prevalence of 10% and 4%, respectively. In relation to the farm size, the Cleaning Cow Index received worse scores in small (14%) and in medium-scale herds (16%) than in large ones (7%).

Higher non-conformity prevalences were detected considering Cows and Calves Mortality Rate; "non-compliance" percentages detected were 20% and 14%, respectively. Large farms are characterized by a higher cow mortality rate, (non conformity prevalence

38%), while in medium and small-scale farms non-conformity values are 20% and 6% respectively.

Regarding calves mortality rate, otherwise, Sicily is characterized by the highest percentages (31.7%), followed by Sardinia (16.0%) and Apulia (10.7%). For Calves Mortality Rate, the non-compliance prevalences detected are about the same regardless to the size of the farms: 17% (medium farms), 16% (large farms) and 11% (small farms).

In 20% of the enrolled farms the prevalence of clinical mastitis was judged "unacceptable"; Sicily is characterized by the highest failure percentage (51.4%), followed by Calabria Region(16.0%); not surprisingly, clinical mastitis seems to be a problem much more controlled in the large-scale farms, where we detected 11% of non-compliances; in small and medium herds the percentage is higher, 26% and 18%. The title of somatic cells in milk, another index reflecting the udder health status, is too high in 23% farms (among these 55% of Sicilian farms). A too high somatic cell title is observed in 33.%, 19% and 10% of small, medium and large farms, respectively.

**Discussion**

The results emerging in the present survey can be interpreted in different ways. First, a legal aspect arises: 22 parameters among the 303 we considered showed non-conformity to the current legislation in force, even if only 13 criteria showed a failure prevalence higher than 10%.

Among those 13 criteria, only few can be easily verified by the competent Authorities and their infringement usually leads to a penalty (e.g. calves tethered, individual pens for calves with solid walls, no bedding for calves less than 2 weeks old, absence of adequate shelters for animals not kept in buildings); other requirements are harder to check, because precise standards are not set by law (e.g. the frequence of training courses for the stock person, minimum dimension of a tie-stall) or because are related to practices not always easily verifiable (calves disbudding before 21 days of age, administration of fibrous food to the calves). Deficiencies we found out in the calves management, in prophylaxis control programs and in staff training confirm the results emerging from our first survey in Emilia-Romagna (Peli *et al.,* 2007), and reveal how those critical aspects are common to most of Italian regions. The high failure prevalences suggest the need of measures to improve the welfare conditions of cows in our Country, with a special regard to those three criteria. Some erroneous practices can be quickly corrected, and without structural adaptations: education of the farmers is crucial to help the changing process; other non-compliances derive from structural inadequacies and need investments to be eliminated.

The most visible aspect emerging from this survey is the inverse proportionality relation between non-compliance prevalence and herd dimensions. Larger farms showed in general the lowest percentages of non-compliance in all the examined Regions; large systems, indeed, usually have greater economic means, and they can invest much more funds in staff training, professional specialized assistance and automatization of the farm. Higher levels of technology and high attention for maintenance seem to lead to a better health condition of the herd.

On the contrary, criteria for which lower non-conformity prevalences have been registered (<1%) can be considered as "strong points" of Italian farming: routine tail docking and other non-therapeutic mutilations, oxitocine administration, erroneous registers compilation, use of unauthorized tools for animals handling, low number or dimensions of cubicles, and, among the direct criteria, stereotyped movements, high approach distance, teat damage, Feces Condition Score, all received non-compliance percentages equal or inferior to 1%.

**Conclusions**

The results of this survey, because of the significant sample of animals, the high number of farms considered, the different size of herds and the geographical diversity of the enrolled Regions, should be worthy of attention to address farmers and competent Authorities in the process of compliance to the law in force and also to find better management practices leading to higher welfare standards, exceeding the minimum requirements set by the rules. Staff training, whose level of attention is inversely related to failure prevalences in almost all areas, has a crucial role in this process.

Moreover, our approach of combining direct and indirect criteria, has allowed us to fully embrace non mandatory recommendations on the use of animal based measures for the assessment of animal welfare, as now accepted into the strategic Plan for the EU animal welfare for 2012-2015.

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**Table 1. Non-compliance/failure prevalences on the whole farm sample (n=943) and related to the herd dimension (intervals shows minimum and maximum prevalence values found out in different productive categories; (*) indicates non-compliance with law in force.**

| | Non-compliance/failure | Whole sample | Small-scale farms | Medium-scale farms | Large-scale farms |
|---|---|---|---|---|---|
| 1. | No alarm system giving warning of a breakdown (*) | 70 | 70 | 70 | 71 |
| 2. | No emergency automatic system (ventilators) (*) | 66 | 61 | 70 | 73 |
| 3. | No training courses on animal welfare for the stockperson | 66 | 77 | 70 | 43 |
| 4. | No colostrum bank | 65 | 71 | 63 | 56 |
| 5. | No control plans for parasites | 65 | 65 | 68 | 64 |
| 6. | Coverage only formed by roof covering | 64 | 61 | 69 | 61 |
| 7. | No structures to protect animals not kept in buildings from adverse weather conditions (*) | 63 | 68 | 57 | 43 |
| 8. | No vaccination program | 61 | 81 | 56 | 32 |
| 9. | No control plan against rodents | 62 | 82 | 64 | 27 |
| 10. | No footbathing | 58 | 83 | 53 | 19 |
| 11. | Fittings for securing animals without anti-suffocating system | 58 | 70 | 63 | 33 |
| 12. | No systems regulating the air flow rate | 57 | 49 | 64 | 66 |
| 13. | Stockperson without specific professional training (*) | 37-57 | 22-78 | 33-58 | 12-26 |
| 14. | No gap in the gable roof ridge | 47 | 62 | 47 | 30 |
| 15. | No programmed veterinary assistance | 43 | 65 | 44 | 9 |
| 16. | No control plan against flies | 43 | 59 | 45 | 15 |
| 17. | No gradual introduction of primiparous cows in milking groups | 39 | 41 | 43 | 32 |
| 18. | No mastitis control plan | 37 | 50 | 41 | 13 |
| 19. | No alternative water supply | 38 | 37 | 41 | 36 |
| 20. | No routinary foot care | 32 | 50 | 30 | 4 |
| 21. | No storage area for toxic waste | 35 | 46 | 39 | 12 |
| 22. | Barriers in the milking parlor entrance | 31 | 25 | 35 | 36 |
| 23. | Inadequate number of water tanks | 20-37 | n.d | n.d | n.d. |
| 24. | No consulting of a nutritionist | 29 | 45 | 27 | 10 |
| 25. | No specific area for loading/unloading animals | 26 | 34 | 26 | 11 |
| 26. | Inadequate frequency of analysis on drinking water | 24 | 28 | 28 | 12 |
| 27. | Low tie-stall dimensions | 25-32 | n.d. | n.d. | n.d. |
| 28. | Individual pens for calves with solid walls (*) | 22 | 9 | 15 | 24 |
| 29. | High number of somatic cells | 23 | 33 | 19 | 10 |
| 30. | No access to a suitable water supply for animals not kept in buildings (*) | 21 | 26 | 13 | 22 |
| 31. | High cow mortality | 20 | 7 | 20 | 38 |
| 32. | High frequency of clinical mastitis | 20 | 26 | 18 | 11 |
| 33. | No quarantine for new entries | 18 | 27 | 20 | 7 |
| 34. | Internal surfaces not easy to clean/disinfect (*) | 18 | 29 | 14 | 8 |
| 35. | No possibility of a rapid evacuation in case of fire | 19 | 34 | 11 | 2 |
| 36. | No exercise corridors | 18 | 24 | 16 | 12 |
| 37. | Inadequate resting area | 16-18 | n.d | n.d. | n.d. |
| 38. | No bedding for calves less than 2 weeks of age (*) | 14 | 12 | 13 | 16 |
| 39. | High calves mortality | 14 | 11 | 17 | 16 |
| 40. | No isolation accomodation (*) | 15 | 23 | 11 | 4 |
| 41. | Disbudding on calves older than 21 days (*) | 14 | 18 | 14 | 7 |
| 42. | Inadequate hygiene measures in the partum area | 14 | 19 | 17 | 5 |
| 43. | No cleaning/disinfection of the pens of the calves (*) | 11 | 18 | 10 | 4 |
| 44. | No fibrous food administered to calves older than 2 weeks (*) | 11 | 13 | 11 | 6 |
| 45. | Calves tethered(*) | 11 | 21 | 5 | 2 |

**Table 2. Presence, maintenance, service registration and assistance percentages of automatic devices on whole farm sample (n=943) and related to the farm dimension.**

| **Auto feeder** | | | | |
|---|---|---|---|---|
| | Presence | Maintenance | Registration | Assistance |
| Total | 43/818 (5.2) | 16/43 (37.2) | 16/43 (37.2) | 31/43 (72.1) |
| Small | 12/341 (3.5) | 2/12 (16.7) | 2/12 (16.7) | 7/12 (58.3) |
| Medium | 13/244 (5.3) | 6/13 (46.1) | 4/13 (30.8) | 7/13 (53.8) |
| Large | 18/232 (7.7) | 8/18 (44.4) | 10/18 (55.5) | 17/18 (94.4) |
| **Unifeed** | | | | |
| | Presence | Maintenance | Registration | Assistance |
| Total | 444/818 (54.2) | 290/444 (65.3) | 114/444 (25.6) | 232/444 (52.2) |
| small | 55/341 (16.1) | 19/55 (34.5) | 4/55 (7.2) | 13/55 (23.6) |
| Medium | 163/244 (66.8) | 91/163 (55.8) | 28/163 (17.2) | 65/163 (39.9) |
| Large | 225/232 (96.9) | 179/225 (79.5) | 80/225 (35.5) | 153/225 (68.0) |
| **Watering** | | | | |
| | Presence | Maintenance | Registration | Assistance |
| Total | 642/818 (78.5) | 157/642 (24.4) | 30/642 (4.7) | 117/642 (18.2) |
| Small | 214/341 (62.7) | 25/214 (11.7) | 6/214 (2.8) | 9/214 (4.2) |
| Medium | 201/244 (82.4) | 57/201 (28.3) | 8/201 (3.9) | 33/201 (16.4) |
| Large | 226/232 (97.4) | 75/232 (32.3) | 16/232 (6.9) | 75/232 (32.3) |
| **Ventilation system** | | | | |
| | Presence | Maintenance | Registration | Assistance |
| Total | 168/818 (20.5) | 39/168 (23.2) | 18/168 (10.7) | 98/168 (58.3) |
| Small | 14/341 (4.1) | 2/14 (14.3) | 1/14 (7.1) | 2/14 (14.2) |
| Medium | 33/244 (13.5) | 6/33 (18.2) | 1/33 (3.0) | 16/33 (48.5) |
| Large | 121/232 (52.2) | 31/121 (25.6) | 16/121 (13.2) | 80/121 (66.1) |
| **Scraper** | | | | |
| | Presence | Maintenance | Registration | Assistance |
| Total | 336/818 (41.0) | 62/336 (18.4) | 27/336 (8.0) | 169/336 (50.3) |
| Small | 56/341 (16.4) | 7/56 (12.5) | 1/56 (1.8) | 9/56 (16.0) |
| Medium | 97/244 (39.7) | 24/97 (24.7) | 9/97 (9.3) | 40/97 (41.2) |
| Large | 181/232 (78.0) | 30/181 (16.6) | 17/181 (9.4) | 120/181 (66.3) |
| **Milking system** | | | | |
| | Presence | Maintenance | Registration | Assistance |
| Total | 808/818 (98.7) | 546/808 (67.6) | 540/808 (66.8) | 642/808 (79.4) |
| Small | 334/341 (97.9) | 149/334 (44.6) | 159/334 (47.6) | 218/334 (65.3) |
| Medium | 242/244 (99.2) | 182/242 (75.2) | 172/242 (71.0) | 197/242 (81.4) |
| Large | 231/232 (99.6) | 214/231 (92.6) | 208/231 (90.0) | 225/231 (97.4) |