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Animal Welfare Assessment in Cattle Farms

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Abstract. *Different methodologies to evaluate animal welfare in cattle farms were proposed in last years. An Italian research team has recently developed a new methodology to assess animal welfare in dairy and beef cattle farms.*

The system called FWI (Farm Welfare Index, Italian letters IBA) is based on a specific check list for each different category of animal. The check list data are elaborated in order to give a farm score on the basis of limited and objective parameters to be recorded during the farm visit. The methodology refers to the well known on-farm index systems, such as the Austrian ANI (Animal Needs Index) providing the general framework of the methodology to be applied on cattle welfare assessment, relying mostly on technical parameters experimentally tested by specific researches, farmer's experience, advisor's experience and by the legislation in force.

So far the 213 assessed farms (172 dairy farms e 41 beef farms) have been scored according to the FWI methodology by a total score on general farm inputs and by partial scores referring to the housing systems used for different cattle categories; in addition calves non conformity are reported.

At the end of the process, every farm is classified by the total FWI score. The index can allocate the farm in one of the 6 different classes with an increasing level of welfare from 1 to 6.

Keywords. Animal welfare, Welfare assessment, Farm Welfare Index, Cattle farms.

Introduction

The welfare of farm animals is a current issue. Defined by Hughes (1976) as that "state of complete mental and physical health in which an animal is in harmony with its environment," it is required not only for ethical reasons but especially to have healthier animals able to provide more wholesome food. Employees and farmers in particular must consider animals' welfare as a great opportunity to improve farming techniques and structures to develop productive services, reduce health issues and add value to farm products.

One of the most important aspects for the welfare and health of animals is the farm environment, defined as all the elements around the animal that condition the life and behavior of the housed animals. Thus, it is not by chance that the environment is the main subject that almost all the current animal welfare evaluation systems focus on.

Among the most important elements that contribute to defining the farm environment is the microclimate (temperature, humidity, air flow), light, gas and dust concentration, noise, the type of housing (single or collective, fixed or free, open or closed), the living space for each animal, the type of flooring (full, slatted, with litter), the shape and distribution of the farm areas, hygiene conditions and the microbial environment, the feeding system (size and type of equipment to supply feed, location of feeding areas), the water distribution system.

To evaluate the aforementioned aspects, the subjects related to farm construction must be studied in particular, paying special attention to the farm and housing systems, structures, equipment and farm facilities and the environmental control of buildings.

Systems to Evaluate Animals' Welfare

The systems to evaluate animal welfare can be subdivided into the following categories:

- systems based on functional farm equipment and facilities tests in order to verify performance and correlation with animals' welfare (for example, the German test *DLG*);
- diagnostic systems based on welfare "indicators" for individual animals (for example, productive parameters or behavioral, health and physiological aspects);
- on-farm index systems that estimate the potential of farming methods and structures to provide animals with a certain level of welfare.

On-farm evaluation index systems, the ones only that interest us at this time, are characterized by basic criteria that can be summarized as follows:

- highlighting the most serious farm system and structures' oversights;
- emphasizing the most relevant aspects for farm animals' welfare;
- rapidity of the evaluation (farm visits and then assigning points) and training evaluators and then lowering evaluation costs;
- increased repeatability of points for objective and measurable parameters (in the case of evaluations repeated at different times or by different evaluators).

These criteria provide the general set up of the applicable approach to evaluate the welfare of raised cattle and rely on consolidated technical parameters, set up through research, experimentation and the experience of farmers and technicians as well as, obviously, current legislation.

For this last point, the following regulations enacted by the European Community and in this country regarding cattle prevail:

- the general regulation dealing with protecting farm animals (*Regulation 98/58/CE* enacted by *Legislative Decree nr. 146* of 26/03/2001);
- the specific regulation to protect calves (*Regulation 91/629/CEE, Regulation 97/2/CE and Decision 97/182/CE,* enacted by *Legislative Decree nr. 533* of 30/12/1992 and with *Legislative Decree nr. 331* of 01/09/1998).

The primary limitation of these evaluation systems is that they cannot rely heavily on scientifically tested criteria, like, for example, possible tests to be carried out on animals (Leeb *et al.,* 2004) or possible laboratory analyses which would involve costs and timeframes that are not compatible with the investigation methods in question.

Another possible critical evaluation point is the time of the farm visit. From this point of view, it is preferable not to establish or give too much importance the evaluation parameters that can vary considerable from season to season. In this regard, an example is the discovery of toxic gas concentrations in farms which, relying heavily on ventilation and moving waste, can vary from summer to winter and from one day to another.

Among the different on-farm evaluation index systems, *ANI* is particularly noteworthy (*Animal Needs Index* or, in the original German, *TGI- Tier-Gerechtheits-Index).* The original and creative idea of creating an animal welfare evaluation index comes from Bartussek, who proposed an animal welfare index as part of the Austrian regulations on factory farming (1985). This index was subsequently drafted and improved to arrive at the current version called *TG1 35 L (*or *ANI 35 L),* applicable to cattle, laying hens and fattening hogs (Amon *et al.,* 1999).

The farm visit is based on the evaluation form where the range of scores assigned are listed based on environmental conditions, technical and technological prerequisites and the measures regarding the how the farm is managed for different functional areas that have an impact on the animals' health and welfare.

TGI 35 L is essentially based on technical farm system requirements, like the availability of space and the quality of flooring and considers 30-40 verification criteria, including: the possibility of moving; the possibility of "social "interactions among animals of the same species; flooring types and conditions; light and air conditions; characteristics of staff working in the barn.

The system purposely leaves out aspects regarding feeding since it is considered that supplying appropriate animal feed is a *sine qua non* condition not so much for wellbeing as the farm's profitability.

The scores given initially varied between one and seven points for each functional area of the farm, for a maximum of 35 points. With subsequent changes, the points were further differentiated, including negative and maximum points other than those initially proposed (from -9 to + 45.5). Now, this system takes into account that animals can counterbalance negative influences in functional areas with positive aspects.

In Austria, the *TGI 35 L* has been used since 1995 for organically certified farms. The minimum score needed to obtain certification is 21 for current structures and 24 for new or renovated buildings. Based on the species in question, the systems gives "importance" to different variables considered.

Based on this concept, another model was developed by Sundrum *et al.* (1994). Created as a contribution for public calls for tender, it provides a simplified method to evaluate animals' welfare on calve, pig and hen farms.

TGI 200 (or *ANI 200*) considers 60 -70 evaluation criteria and, in particular, emphasizes factors that impact animals' health. The points assigned are within a variable range from zero to 200. The reason for such a high score is due to the possibility of various special features occurring in various functional categories. For this reason, based on the type of species and the purpose of the farm, it is not always possible to reach the maximum number of points in terms of excellent care and health.

Methodology

A group of researchers at the Research Centre on Animal Production in Reggio Emilia, the Department of Food Protection and Valorization of University of Bologna and the Department of Agricultural and Forest Engineering of University of Florence fine-tuned an evaluation system for farm animals' welfare as part of the activities carried out for a project financed by Emilia-Romagna Region.

The project aimed at providing and testing the check lists and experimentally evaluating them with a significant sample of cattle farms to verify how they comply with regulations and reference technical requirements for animal welfare.

Below, the main activities carried out for the project are summarized:

- codifying the FWI evaluation system, singling out macro survey areas and aspects of the farm to emphasize;
- fine-tuning checklists and how they are tested at the farms;
- filling out the checklists at dairy and beef cattle farms;
- creating an appropriate spreadsheet (an *Excel* file) to input the data colleted and automatically assign points and a FWI class;
- checking and validating the data collected and inputting them on a spreadsheet created for that purpose;
- correcting the pending spreadsheet and validating it;
- classifying the farms using the FWI system, processing sample data and conclusions drawn.

The evaluation system called FWI (Farm Welfare Index, Italian initials IBA) is based on a checklist that allows points to be assigned based on wellbeing, starting with a limited number of objective parameters that are easily measured during the farm inspection. Nevertheless, in some cases, subjective evaluations must be used because aspects such as the internal surface areas of barns and the cleanliness of troughs would requires time and special equipment to be evaluated in a way that can then be used. Additionally, it is unanimously agreed that evaluating animal welfare cannot be completely objective.

Different variants of the checklist can be used for all types of cattle farms (dairy or beef cattle) with housing in buildings; moreover, there is a simplified form for free-range beef cattle farms.

The parameters studied refer to the following main themes:

- farms systems and barn structures;
- structures for calving and isolation;
- structures for milking (for dairy cows only);
- environmental control:

- feed and drinking water;
- animals' hygiene, health and behavior;
- checking animals, equipment and facilities;
- farm staff.

The checklist for assigning the FWI is subdivided into different parts (*table 1*). For each farm unit, a general form must be filled out (form A or form AA), a form for each farm building (form B) and a form for each type of animals kept inside each building (form C, CC, D, E, F, G, H, L, M and N). Different functional areas are considered for each building and for each type of animal: resting area, feeding area, exercise area and milking area (only for dairy cows).

For example, in the case of dairy cows with a building where milking cows and replacement heifers are housed and a building where dry cows, replacement heifers and unweaned calves are housed, the following charts must be filled out:

- n° 1 form A - General Part;
- n° 2 form B - Building;
- n° 1 form C - Milking Cows Sector;
- n° 1 form D - Dry Cows Sector;
- n° 2 form E - Replacement Sector;
- n° 1 form F - Unweaned Calves Sector.

Table 1. Parameters Included in the FWI System Checklist for Cattle.

FORM	PARAMETERS
A - GENERAL PART (dairy cows) AA - GENERAL PART (beef cattle)	General data on the company and farm, managing animals, checking facilities and registration, staff, structures for calving and isolation, health
B - BUILDING	Categories of cattle present, barn features, environmental control, level of cleanliness and state of the internal areas of the building and of the equipment
C - MILKING COWS (loose housing)	Type of pen, passageways, doors and enclosed corridors, features of drinking troughs, features of various functional areas (rest area, feed area, exercise area, waiting area and milking room), cooling in summer, hygienic-sanitary and behavioral aspects
CC - MILKING COWS (tied housing)	Features of drinking troughs, features of pens and mangers, cooling in summer, hygienic-sanitary and behavioral aspects
D - DRIED COWS	Type of barn, drinking trough features, features of various functional areas (rest area, feed area and exercise area)
E - REPLACEMENT HEIFERS(1)	Type of barn, drinking trough features, features of various functional areas (rest area, feed area and exercise area)

F - UNWEANED CALVES [2]	Breeding phases, individual and/or collective stalls, features of drinking troughs, other features of stalls, exercise area, presence of artificial ventilation, hygienic-sanitary aspects
G - WEANED CALVES [3]	Breeding phases, individual and/or collective stalls, features of drinking troughs, other features of stalls, exercise area, presence of artificial ventilation
H - BULLS	Features of housing area, size and features of exercise area
L - MILKING COWS (loose housing)	Type of pen, passageways, doors and enclosed corridors, features of drinking troughs, features of various functional areas (rest area, feed area, exercise area, calf stalls not accessible to cows), hygienic-health care and behavioral aspects
LL - MILKING COWS (tied housing)	Features of drinking troughs, features of pens and mangers, calf stalls not accessible to cows, hygienic-health care and behavioral aspects
E - FATTENING CALVES[4]	Individual and/or collective stalls, features of drinking troughs, other features of stalls, exercise area, presence of artificial ventilation, hygienic-sanitary aspects
N - BEEF CALVES[5]	Type of barn, drinking trough features, features of various functional areas (rest area, feed area and exercise area), hygienic-sanitary aspects

(1) replacement cows older than 6 months up to impregnation; (2) cattle from 0 months to weaning; (3) cattle from weaning to 6 months; (4) beef cattle up to 6 months old; (5) beef cattle more than 6 months of age at slaughtering.

To make it easier to fill out, all questions that must be answered by the head farmer have been placed in the General Part of the form while the remaining forms in the checklist can be only filled out by the surveyor through observation, measuring and evaluation. The only equipment that a surveyor has are a compass, an 8-m flex meter and a laser diastimeter.

Types of Questions and Assigning Points

One of the most complex aspects in defining an evaluation method for welfare is certainly assigning points to the individual questions and the groups of similar questions by type. In fact, it is important to carefully weigh the different parameters in question in order to create a reliable and sufficiently objective classification grid that fulfills the goal of evaluating farm animal welfare.

There are essentially four types of questions on the checklist:

1. free response or description;
2. yes/no answer;
3. codified answer;
4. numeric answer.

Several type 1 questions are not assigned points and are only intended to more precisely characterize the farm and allow further cross-checks with other types of questions.

Assigning points must be varied based on the relative importance given to individual questions; in fact, always using the same points is not helpful (for example, 0-3 points or -1 to +1) as shown by several evaluation systems that are used because the same importance is given to aspects that can have very different significances.

In short, by defining the classification system, the following basic criteria were respected:

- assigning higher maximum scores and minimum negative scores for the most important and easiest aspects to evaluate like, for example, the type of housing or farm surface area;
- assigning the lowest maximum scores to detailed, or less important, aspects and more uncertain evaluation parameters, like those that require a more subjective evaluation by the surveyor;
- setting up an adequate program to calculate points that takes into consideration the type of questions and how they interact and provides for different possibilities in terms of the number of forms to fill out.

Regarding this last point, the importance of several points in terms of the numeric factors, such as the number of animals, becomes more significant. This is aimed at avoiding, for example, that very good scores for aspects that involve few animals (bulls or calves) receive a better overall score for a farm that does not have many points, for example, for dairy cows (much more important and greater in number). The question was resolved by adopting a diversified point grid that provides for greater values for aspects that involve more important and numerous categories of animals.

Considering the noticeable variability of cattle farms' productive organization, particularly at beef cattle farms, an approach by farm type was selected, focusing on preparing specific checklists by each codified type, as listed below:

- *BL checklist*, which applies to all the dairy cow farms with housing systems (for the dairy sector, free range farms are not included because they are rarely used in the Emilia-Romagna region);
- *checklist BC-RS1,* for beef cattle farms with housing systems, closed cycle cow-calf line;
- *checklist BC-RS1,* for beef cattle farms with housing systems, open cycle cow-calf line;
- *checklist BC-RS1,* for beef cattle farms with housing systems, mixed cycle cow-calf line;
- *checklist BC-RS1,* for beef cattle farms with housing systems, veal and/or beef calves;
- *check-list BC-PA*, for beef cattle farms that use grazing for at least 7 months a year and for at least 60% of the animals raised on average a year.

A different variety of forms is paired with each type of checklist as well as different distribution of points. Instead, the final classification stays the same for all types of farms, obviously based on different point ranges.

FWI Dairy Cows

To simplify, the applicable FWI methods are illustrated below for dairy cows only (checklist BL), keeping in mind that the FWI system provides another type of checklist that, using similar logic, is applied to other types of beef cattle farms.

The checklist BL is made up of the following forms (*table 1*): A, B, C, CC, D, E, F, G and H. Forms C and CC are only filled out respectively for loose and tied barns for milk cows; form H is filled out only if there are bulls at the farm.

The milk farms' FWI score can vary from a theoretical minimum of 131 to a theoretical maximum of 256 and is made up of the sum of 3 partial scores:

- *GENE* score, for general data, ranging from -18 to 55;
- *BUIL* score, for buildings, ranging from -14 to 38;
- *CATE* score, for cow categories, ranging from -99 to 163.

Obviously, these minimum and maximum scores are absolutely theoretical and are not seen at a real farm, where there is always a mix of positive and negative aspects which sometimes lean more one way than the other.

A farm's *BUIL* score is obtained from the weighted average of the total live weight for the individual scores for each building. The *CATE* score comes from the sum of the points assigned to the various cow categories, which are as follows:

- milking cows sector, from -58 to 80.5 points,
- dry cows sector, from -13 to 25 points,
- replacement cows sector, from -13 to 24 points,
- calves sector, from -15 to 24 points,
- bull sector, from 0 to 9.5 points,

In reality, the maximum *CATE* score being 100, the various categories are worth the following percentages:

- milking cows sector 50%,
- dry cows sector 15%,
- replacement cows sector 15%,
- calves sector 15%,
- bull sector 5%.

The FWI evaluation system assigns a welfare index for each farm evaluated; the index value places the company in one of 6 prearranged levels. The extenuating elements to assign dairy cow farms a FWI class are the total FWI score, the partial form C/CC score (dairy cows), non-compliances in the forms for calves and negative points in one or more macro areas. The 6 classes are defined below.

Class 1 - Farm does not comply with the minimum welfare requirements:

a) it has a FWI score less than or equal to 0;

b) even with a FWI greater than 0, there are serious non-compliances in the Calves forms; in this case, the potential FWI class does not match the effective FWI class.

Class 2 - Farm with a low level of welfare:

a) it has a FWI score between 0.1 and 55;

b) even with a FWI greater than 55, it has a negative score in one or more macro areas (*GENE, BUIL* and *CATE*) or in the form C/CC.

Class 3 - Farm with a sufficient level of welfare:

it has a FWI score between 55.1 and 80 and a positive score for the three macro areas and form C/CC.

Class 4 - Farm with a fairly good level of welfare:

it has a FWI score between 80.1 and 100 and a positive score for the three macro areas and has a form C/CC score greater than 15.

Class 5 - Farm with a good level of welfare:

it has a FWI score between 100.1 and 120 and has a form C score greater than 23 (form CC does not attain this score).

Class 6 - Farm with an excellent level of welfare:

it has a FWI score greater than 120 and a form C score greater than 30. In this case, negative points are not allowed in the different forms that make up the checklist, i.e. this means that if there is just one form with a negative score, the farm is automatically declassified to the previous class (class 5).

Assigning the FWI is accompanied by a short technical chart that lists the most serious oversights found in order to allow the company to make these changes aimed at improving the level of its animal welfare.

Results of Sample Investigation

The sample investigation was carried out at 213 cattle farms in Emilia-Romagna Region. This work phase is aimed at testing the prepared detection system in-depth, highlighting potential problems or errors and allowing the work group to make useful suggestions on the operative level to further fine-tune the methodology and for its definitive validation.

The checklists were filled out at 172 dairy farms and at 41 beef cattle farms. In general, the farms collaborated well in the initiative and farmers were fairly interested in the aspects of the animal welfare.

In order to collect the enormous mass of information gathered through the farm checklists in a more orderly manner and to be able to safely and quickly evaluate the farm, an appropriate computer program was provided. The basic program is represented by a normal Excel file, organized in a certain number of worksheets based on the type of farm in question.
The answers to the farm's questionnaire questions are classified in the following 5 types of storage programs:

- descriptive answer (des), without assigning points, requires entering a string of text;
- codified answer (cod), requires entering a numeric code (1,2,3, etc); the code and any points are listed in the Code sheet;
- numeric answer (num), requires entering a numeric value from the questionnaire; the value range code and any points are listed in the Code sheet;
- yes/no answer (yn) requires entering “y” for yes and “n” for no; any points assigned are indicated in the “Min and Max Points” column on each sheet;
- automatic answer (aut), calculated from the worksheet based on the data entered; the value range code and any points are listed in the Code sheet.

Numerous logical functions were entered in the worksheets that make entering data easier, limiting the possibility of error. In the forms on calves (F, G and M), in particular, several functions are entered that display a YES or NO based on the question that directly references the regulation on calves' wellbeing; displaying NO is a non-compliance for a particular aspect in the case where the farm should have already been compliant with the last version of the regulation in question (for all farms, starting from 1ST of January 2007).

Non-compliance for calves was subdivided in two groups, the second of which is for “serious” non-compliances which automatically causes a change in the FWI classification, regardless of

the score obtained. Non-compliances are evaluated as not serious when, based on that set forth by the regulation, there are major interpretation questions or they are more difficult to verify during the farm inspection.

Calf-related non-compliances are automatically listed in the final FWI sheet, the “serious" ones in bold and the remaining ones in italics.

The program automatically assigns points for the individual parameters evaluated based on the response input (numeric value, yes/no) in the relative spreadsheet cell.

Entering the data of 213 companies in different input programs allowed farms to be evaluated and classified based on the FWI methodology. The sample companies are subdivided by farm type:

- 172 dairy farms;
- 11 RS1 beef cattle farms;
- 7 RS2 beef cattle farms;
- 18 RS4 beef cattle farms;
- 5 PA beef cattle farms (grazing).

Limiting the analysis to dairy cows only, the sample of 172 farms is particularly representative of the reality in the Parmigiano-Reggiano area, the most important in the region (85% of farms).

In terms of size, the average farm has 90 milking cows (cows usually milked) with a maximum of 350 cows and a minimum of just 15 cows; the standard deviation is thus rather high, about 57.4 cows. The most represented class is between 51 and 100 milking cows, 51% of the sample; after which, there is the class of 201-300 cows, 20% of the farm total.

If the farm’s total capacity is considered (total number of cows raised), the average is about 192 animals, which means that, on average, the number of milking cows does not exceed 50% of the cows raised on average. In this case, most farms belong to the 101-200 animal class.

The average farm in the sample has 2.2 buildings to raise cattle, with a minimum value of 1 and a maximum value of 7 while the number of farm staff is 2.7 on average with a respective minimum and maximum of 1 and 8 workers.

The relatively high average farm size justifies the net prevalence of loose housing compared to tied housing; 84% of the farms raises their cows in free barns while the first class size (up to 50 milking cows) and, in part, the second class (from 51 to 100 cows) uses tied systems.

In terms of average milk production, there is a production of about 8.2 t per milking cow with maximum values of around 11.5 t and minimum values of about 5 t; this last aspect is clearly influenced by the breeds raised since the farms with lower average productions are among the few that do not raise Frisona cows but rather raise more rustic and less productive native breeds (e.g. Reggiana).

Overall, the dairy farms in the sample show a fairly good structural and managerial balance in terms of the animal welfare. No company is in Class 1 due to its FWI score because all the companies have a score well above 0. In terms of the FWI score, the sample shows an average equal to 89.5 and a standard deviation equal to 23.7. The first company in descending order has a total score of 144.2 points while the last on the list has a score of 30.8. The sample’s range is then 113 points. As seen, these values are far from the theoretical maximum and minimum FWI scores that we talked about, which showed a theoretical variability field of 387 points.

Several interesting considerations can be made about the various partial scores that make up the FWI.

In terms of the 3 macro areas, there is a different level of appropriateness compared to the standards required by the evaluation system. If the average sample value is compared to the average theoretical score for the same area (attainable as the theoretical maximum and minimum mathematical average), it is noted that the *BUIL* area has a real average that is practically double the theoretical one while the two averages are very similar for the *GENE* area. This means that the farms comply with the standards on farm buildings more than the other aspects studied.

Form C (milking cows sector in loose barns) has a real average that is more than two times the theoretical one and form F/G (calves) has a real average that is almost two times that while, in terms of form D (dry cows) and form E (replacements), the real averages and theoretical averages are almost identical. This confirms that observed during the farm inspection and data entry and, that means that in general, the dairy farms are fairly compliant in terms of milking cows' wellbeing while they are not as compliant for dry and replacement cows.

In terms of “potential” FWI classes, or those that only come from points obtained from the farm, excluding those non-compliant for calves, the sample farms’ distribution is as follows:

- Class 1: 0 farms
- Class 2: 17 farms
- Class 3: 46 farms
- Class 4: 57 farms
- Class 5: 35 farms
- Class 6: 17 farms.

If, instead, it refers to the effective FWI class, which includes "serious" non-compliances for calves, the sample distribution is as follows:

- Class 1: 70 farms
- Class 2: 7 farms
- Class 3: 25 farms
- Class 4: 29 farms
- Class 5: 27 farms
- Class 6: 14 farms.

As can be noted, the problem of “serious” non-compliances for calves is decidedly important for the farm samples in question: 40% of the farms have problems with calves’ wellbeing. Obviously, the number and type of non-compliances vary based on the farm: in particular, it is noted that 26 farms have a single non-compliance and so are in a not particularly critical and easily modifiable situation while another 30 companies have 2-3 non-compliances.

Conclusion

The project prepared a new evaluation system for the animal welfare at cattle farms. The FWI system (Farm Wellbeing Index, Italian letters IBA) is based on filling out a checklist that varies

based on the type of farm and allows a score to be assigned, starting with a relatively limited number of objective parameters that can be easily measured during the farm visit.

The methodology inspires the on-farm index systems, including the famous Austrian ANI (Animal Needs Index), which provides a general framework for the applicable approach to evaluate cattle's wellbeing, relying on prepared consolidated technical parameters, experimentation and the experience of herders and technicians as well as, naturally, current legislation.

The FWI system is characterized by the following basic elements:

- highlights the most serious system and farm structure oversights, allowing the farmers to receive more useful and specific information to improve animal welfare;
- emphasizing the most relevant aspects for farmed animal welfare;
- the evaluation is relatively quick (a farm visit lasts 1-2 hours, based on the complexity of the farm and the number of buildings);
- training evaluators does not take long, even if it is preferable to use staff with a certain amount of farm and farm structure experience;
- thanks to the software available, entering data and the evaluation is quick and relatively simple and the possibilities of error are kept to a minimum.

Obviously, the methodology created and validated can also be improved and sharpened and, in particular, it must deal with most of the audit or experimental technical and economic report, among the levels of welfare measured with the FWI, average farm productive performances and production costs.

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