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On-pasture and On-farm Welfare Measurement Protocol for Horses

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Abstract—Despite the availability of a validated welfare assessment protocol for horses at European Union level, this document does not provide the welfare measurement of horses reared on extensive (ES) or confined (CS) system which encompasses resource-, management- and animal-based measures. The aims of the present study were to develop and test a specific welfare measurement protocol for horses reared in ES or CS systems, and to evaluate whether the selected welfare items were influenced by the breeding management (ES vs CS). A focus group selected 82 welfare items that were classified into 6 measurement/thematic areas. The protocol was applied on 26 pastures and 7 confined farms of Mount Catria and neighbouring areas of the Central Apennines (Italy) by evaluating a total of 490 horses. The relative frequencies (%) for the answers were calculated and the Chi-squared test was used to identify if there were differences within the selected measurement/thematic areas according to the breeding management (ES vs CS). Differences between the ES and CS were found on training ($p=0.02$) and feeding ($p=0.001$). The application of the welfare measurement protocol resulted an useful tool to identify the welfare items that need to be improved in field condition and could represent an innovative tool to fill the existing gap of knowledge as well as to support the official controls of veterinarians.

Index Terms—welfare measurement; welfare items; horse; pasture; confined farm

I. INTRODUCTION

In contrast with other animal species, horses are kept for different purposes as livestock, work, sport, leisure and pet animals [1] and – accordingly – they are differently housed and managed. The only validated tool at European Union level for the welfare assessment of the horses is represented by the Animal Welfare Indicators (AWIN) welfare assessment protocol [2]. However, as clearly underlined in the section dedicated to the aims of the AWIN protocol, this tool is intended for the welfare assessment of singles stabled horses aged more than 5 years old. Moreover, it is based on animal-based indicators and some criticisms have been made concerning the difficult in applying protocols built on animal-based indicators at farm level since they are time-consuming and costly [3]. According to the experience of the Italian National Reference Centre for Animal Welfare (CRenBA), the welfare assessment should involve the evaluation of a panel of welfare measures – resource-, management- and animal-based. The evaluation of all those measures is considered efficient to identify conditions of hazards or welfare impairments [4]. Moreover, CRenBA developed an innovative, integrated, web based monitoring system named “ClassyFarm” that not only allows to obtain

a risk characterisation of farms, but also address to develop preventive interventions for the main weakness of livestock [5]. Nowadays, there are not guidelines or protocols which include resource-, management- and animal-based measures that can be used both at farm and pasture level to measure horse welfare. Therefore, there is the need to fill this gap in order to help breeders to apply best practices to ensure the welfare of their animals as well as to support the official controls of veterinarians. The present study represents a part of a larger research project aimed at improving horse welfare, breed biodiversity and sustainable animal productions in central Italy. In particular, the aims of the present study were (i) to develop on the basis of the available scientific literature a specific welfare measurement protocol for horses kept on pastures and on confined farms; and (ii) to evaluate whether the selected welfare items were influenced by the breeding management (extensive system with horses kept on pasture vs confined system with horses housed in barns).

II. MATERIAL AND METHODS

The present study was approved by the Ethical Committee of the Department of Veterinary Sciences of the University of Turin (Italy, Prot. 1129 04/21/2021).

A. Welfare Measurement protocol

The protocol was developed by a team of 4 veterinarians – expert in equine welfare (focus group). After reviewing the available scientific literature, the focus group selected 82 welfare items on a multiple choice checklist which encompassed resource-, management- and animal-based measures. The developed protocol was built taking into account horses reared in extensive systems and in confined systems. Each welfare item had two or three options for the answer: inadequate/adequate; or inadequate/adequate but improvable/optimal. Six different measurement/thematic areas were identified:

- Training: related to staff training and experience, animal handling and management of animal groups;
- Feeding: related to feeding management (provision of adequate forage and feedstuffs), pasture quality and management, water management;
- Facilities: aimed at identifying the adequacy of the indoor housing or pasture in which the animals were kept (e.g. bedding management, environmental temperature, air quality and ventilation, lighting, space available);
- Animal-based measures (ABMs): measures directly assessed on the animals with the aim to predict welfare conditions at farm or pasture level (e.g. body condition score, integument alterations, hair coat condition).
- Biosecurity: related to practices of preventive veterinary medicine (e.g. management of visitors, quarantine routines, pests control);
- Health management: related to animal's health care (e.g. vaccination programs, parasite management, foal's management).

B. Data Collection

The welfare assessment was carried out on extensive farms with horses kept on 26 different pastures and on 7 confined farms of Mount Catria and neighbouring areas of the Central Apennines (Figure 1). In the confined farms horses were kept in barns with two open sides and free access to outdoor dry lot paddock. A total of 33 surveys were conducted by a trained veterinarian expert on welfare protocols between June 2021 to September 2022.

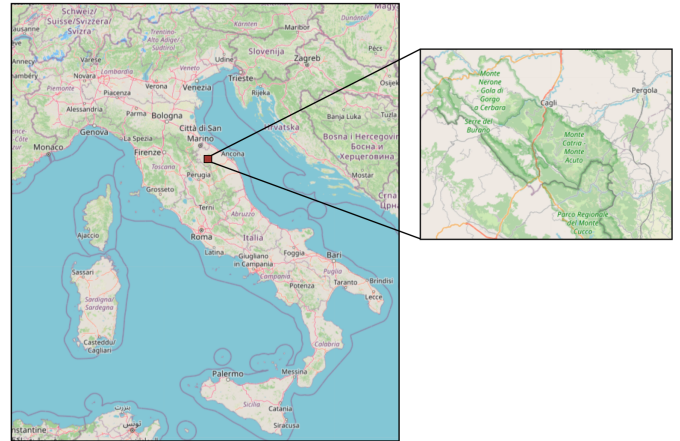


Fig. 1. Mount Catria and neighbouring areas of the Central Apennines in which the developed welfare measurement protocol was applied.

C. Data analysis

Data analysis was performed by using Python packages ‘SciPy’ v1.2.1, p<lt (Python Software Foundation). The relative frequencies (%) for the answers – inadequate/adequate; or inadequate/adequate but improvable/optimal – were computed by considering the belonging to the specific measurement/thematic area. A chi-squared test was used to identify differences within the selected measurement/thematic area according to the breeding management (extensive system, ES vs confined system, CS). P-values < 0.05 was considered significant to infer that the differences between the different measurement/thematic areas were related to the breeding management conditions (ES vs CS). Moreover, a summary statistics of the welfare items scored as inadequate was performed. Accordingly, we identified the critical measures with inadequate responses that require to be improved at pasture or at farm level.

III. RESULTS AND DISCUSSION

The horses evaluated in this present study belonged to the Catria horse breed, an autochthonous Italian breed that origins from Mount Catria and the neighbouring areas of the Central Apennines. According of the Food Agriculture Organization (FAO) [6], the Catria breed represents one native Italian horse breed currently considered in endangered status. Moreover, the database Equidae (BDE) as of December 2022 showed that the Catria horse population in Marche was 902 heads

[7]. In the present study, a total of 420 horses – 13 stallions, 240 mares and 167 foals – were evaluated from pastures; whereas 70 horses – 7 stallions, 40 mares and 23 foals – were evaluated from confined farms; thus accounting for almost half the animals registered in BDE. In the past, this horse was traditionally used in mountain agriculture, whereas now it is mainly utilized as a saddle horse for leisure activities (e.g. mountain trekking) and for meat production [8]. Trombetta et al. [9] have carried out in 2017 a preliminary survey on the nutritional characteristics on Catria horse meat with the aim to recover less favoured grazing mountain areas and to fill the gap of knowledge on Catria horse meat quality. As stated by the same authors, further investigations are needed concerning the nutritional value of Catria horse meat to increase consumer awareness of this product. Although the presence of some studies concerning the nutritional quality of the final product, it is important to underline that there is a lack of scientific literature assessing equine farming conditions and how to safeguard horse welfare [10]. The measurement of animal welfare is a multidimensional and complex procedure that should include resource-, management- and animal-based measures in order to describe all components of animal welfare [3]. Therefore, in the present study, we developed a welfare measurement protocol for horses reared on extensive (ES) and confined (CS) systems by including resource-, management- and animal-based measures in line with the experience of the of the Italian National Reference Centre for Animal Welfare (CRENBA). The protocol was applied on field and the data obtained by the surveys were analysed to evaluate if the selected welfare items were influenced by the breeding management (ES vs CS).

As shown in Figure 2, the main differences between the two breeding systems (ES vs CS) were found on two measurement/thematic areas: training ($p = 0.02$, Chi-square test) and feeding ($p = 0.001$, Chi-square test).

ES and CS, we performed a descriptive statistic by considering the welfare items scored as inadequate. In particular, in Table I are showed the number and percentages (%) of farms in which the studied welfare items were judged as inadequate for more than the 20% of the cases.

Concerning the training area, the 38% of the selected welfare items resulted inadequate in the extensive system (ES) compared to the 18% of the confined system (CS) (Figure 2). According to Table I, the main critical welfare item of the training area was represented by the feeding management of the animals according to the group compositions – age, sex and physiological status (100% of ES and 100% of CS). Moreover, the welfare items that should be improved were the daily inspection of the horses (65.4% ES vs 14.3% CS), and the number of stockpersons employed for the inspection and management of the animals (34.6% ES vs 14.3% CS).

As well as the feeding management according to the group composition within the training area, also the feeding strategy represented the major concern in both ES and CS (Table 1). In fact, the 100% of the responses judged the diet as empirical without taking account the nutritional requirements of the horses. Moreover, the 100% of the CS farms fed horses with inadequate quantity of feedstuffs by exceeding the safe level of 2 g of starch/kg bodyweight/meal that could represents one risk factor for the onset of gastrointestinal disorders [11, 12] as well as negative behavioural consequences [13].

The CS system was also characterised by 42.9% inadequate water provision as restricted access to ad libitum water or poor functioning of automatic drinkers with a flow rate lower than 5 liters/min [14]. No differences were found between ES and CS according to the other measurement/thematic areas (Figure 2). However, according to Table I, several welfare items required attention and should be taken into account to improve horse welfare with particular attention to biosecurity and health management as important practices of preventive veterinary medicine. The application of well-designed welfare measurement protocol together with the use of new precision livestock farming technologies represent non-invasive tools to both investigate and to improve animal welfare. The “Classy-Farm” system has not been still developed for horses but the welfare measurement protocol developed in the present study could represent a starting point. In fact, it has allowed to recognise the main weaknesses of the evaluated horse population in order to appropriately address future preventive interventions.

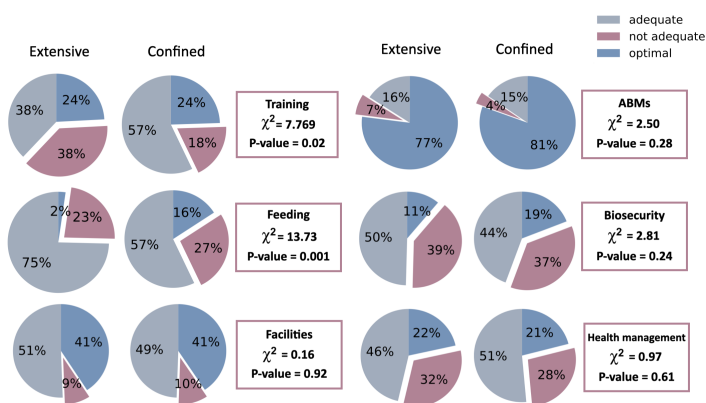


Fig. 2. Comparison of the extensive and confined systems according to the relative frequencies (%) for the answers – inadequate/adequate; or inadequate/adequate but improvable/optimal – within the selected measurement/thematic areas – training, feeding, facilities, animal-based measures, biosecurity, health management.

In order to obtain insight into the main weaknesses found in

TABLE I
SUMMARY STATISTICS OF THE WELFARE ITEMS SCORED AS INADEQUATE FOR MORE THAN THE 20% OF THE EXTENSIVE FARMS (ES) AND CONFINED FARMS (CS).

Measurement areas	Welfare items	Inadequate score in extensive farms	Inadequate score in confined farms
		n = 26, 100%	n = 7, 100%
Training	Inspection of horses	n = 17, 65.4%	n = 1, 14.3%
	Feeding management according to group composition (age, sex and physiological status)	n = 26, 100%	n = 7, 100%
	Number of stockpersons	n = 9, 34.6%	n = 1, 14.3%
Feeding	Feeding strategy	n = 26, 100%	n = 7, 100%
	Feedstuffs management	-	n = 7, 100%
	Water provision	n = 3, 11.5%	n = 3, 42.9%
Facilities	Bedding quantity on outdoor shelters in indoor boxes	n = 1, 3.8%	n = 2, 28.6%
	Management/bedding cleanliness of the foaling area	n = 26, 100%	n = 4, 57.1%
Animal-based measures	Body Condition Score (BCS) of adult horses	n = 14, 53.8%	n = 3, 42.9%
	BCS of foals	n = 8, 30.8%	n = 1, 14.3%
	Annual mortality rate (foals)	n = 12, 46.2%	n = 1, 14.3%
Biosecurity	Horses are reared with other farmed animals	n = 19, 73%	-
	Nursing area	n = 3, 11.05%	n = 2, 28.6%
	Control measures against pests, wild and domestic animals	n = 20, 76.9%	n = 5, 71.4%
	Measures applied to avoid the introduction of diseases by workers, visitors and vehicles	n = 21, 80.8%	n = 6, 85.7%
	Management of carcasses	n = 11, 42.3%	n = 4, 57.1%
	Loading and unloading procedures	n = 8, 30.8%	n = 3, 42.9%
Health management	Knowledge of the main equine bacterial diseases	n = 8, 30.8%	n = 2, 28.6%
	Knowledge of the main equine parasitic diseases	n = 11, 42.3%	n = 2, 28.6%
	Vaccination programs	n = 18, 69.2%	n = 6, 85.7%
	Parasitic management	n = 12, 46.2%	n = 2, 28.6%
	Dental care	n = 18, 69.2%	n = 2, 28.6%
	Health management of foals - navel disinfection and colostrum management	n = 15, 57.7%	n = 4, 57.1%

IV. CONCLUSIONS

The present study allowed to develop a specific welfare measurement protocol for horses based on resource-, management- and animal-based items that can be applied at pasture and at farm level. The welfare of the evaluated horses resulted influenced by the breeding system (extensive vs confined) in relation to the training and feeding measurement/thematic areas. Moreover, it was shown the usefulness to apply a specific welfare measurement protocol for horses to identify welfare measures that need to be improved in the light of the dissemination of best farming practices. The implementation of best farming practices is crucial to safeguard horse welfare, local breed biodiversity as well as environmental and economic sustainability. Further researches are needed to validate the developed welfare protocol by expert knowledge elicitation and by the application of a risk assessment methodology.

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