

Performance recording and genetic evaluation of *Equus genus*

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The ICAR Board based on interest of Breeding Organizations (BO) agreed to include performance recording and genetic evaluation of *Equus genus* into its programs. The ICAR Equid Ad Hoc Advisory Committee (Equid AC) was proposed by ICAR with the objectives to evaluate the benefits that ICAR can provide in the fields of performance recording and genetic evaluation to current ICAR members and other equids' organisations. The priorities for the Equid AC are to establish a list of worldwide contacts involved in Equid recording and genetic evaluation and to liaise with ICAR governing and technical bodies to identify the range of activities that ICAR could potentially offer to support recording and genetic evaluation of equids. In order to achieve these objectives, a Survey to equid stakeholders have been proposed to determine the scope of current and potential future activities that could be supported by ICAR in the future. The Survey has been carried out by the means of a questionnaire including basic information and specific questions. The emphasis has been placed on future activities, namely parentage verification based on SNP markers. Members of Equid BO have been invited to fulfil the questionnaire through online application developed for this purpose available at the following link: <https://rodica.bf.uni-lj.si/EquidAC>. The Survey response is in ongoing phase and so far 33 breeding organizations have responded. A total of 149,334 animals were included in the breeding work of these organisations, comprising approximately 58,997 broodmares and 5,472 stallions. The results are encouraging and show the great interest in harmonization under ICAR umbrella for almost all traits. To evaluate feedback from Equid interests, a comprehensive report with recommendations will be prepared for consideration by the ICAR Board.

Abstract

Keywords: Equus genus, Equid AC, Breeding organisations, Survey, Online application.

Introduction

Performance recording in horses and donkeys is not yet standardised worldwide. Therefore the ICAR Board, recognizing the interest of Breeding Organisations (BO), agreed to include performance recording and genetic evaluation of *Equus genus* into its programs. The first step was to establish the ICAR Equid Ad Hoc Advisory Committee (Equid AC) following Terms of Reference (ToR) with the objectives to evaluate the benefits that ICAR could provide in the fields of performance recording and genetic evaluation to the current members of ICAR and other organisations interested in the *Equus genus*. The following priorities of the Equid AC have been pointed:

1. Establishing a comprehensive list of worldwide contacts with an interest in Equid recording and genetic evaluation.
2. Identifying the range of activities that ICAR could potentially provide to support equid stakeholders.
3. Conducting a Survey of Equid interests.
4. Evaluation of feedback from equid stakeholders by preparing a comprehensive report with recommendations for consideration by the ICAR.

In order to achieve these objectives and get feedback from the worldwide BO, the Equid AC developed online data collection through Survey. The questionnaire concern interest in performance recording, parentage verification, and genetic evaluation of Equids. The main breeds of interest are local (indigenous) horse and donkey breeds which lost economic value over the last century.

Material and methods

The Survey was developed with the assistance of all Equid AC members. The questionnaire included basic information (BO contact data, country, city, address, e-mail, contact details of organization representative person) and specific questions including information about the breed (breed and breed type, number of breeders, number of equines, number of breeding animals - broodmares and stallions, and number of foals), main and optional use of the breed, information about parentage verification and parentage verification method, selection criteria (main and additional traits according to breeding programme), and future plans and interests (parentage verification, collaboration with ICAR, potential traits of interest and future activities). The Survey has been hosted at the University of Ljubljana, Biotechnical Faculty, Department of Animal Science and accessed via link <https://rodica.bf.uni-lj.si/EquidAC>. A link to an online questionnaire was distributed via e-mail lists from BO. The Survey was launched in September 2019 and is in ongoing phase. At the beginning, the response was lower than expected because of several reasons such as English language (many people are not familiar with foreign language), lack of knowledge, lack of relevant contacts for each breeding organization – often volunteer / not professionals in breeding organisations). For the last, the European Regional Focal Point for Animal Genetic Resources i.e. National Coordinators were involved to obtain relevant BO contacts. The feedback was positive and questionnaire was sent to many BO. Since the most of the contacted persons need to be reminded several times before responding, the automatic reminder was generated under the online application.

Statistical package SAS (SAS Inst. Inc., 2009) was used to analyse data and to perform descriptive statistics and graphs.

So far 33 BO have responded to the online Survey (Figure 1). Most of them bred warm-blood horse breeds (around 50%). The rest includes cold-blood breeds (25%) followed by pony and small horses (13%).

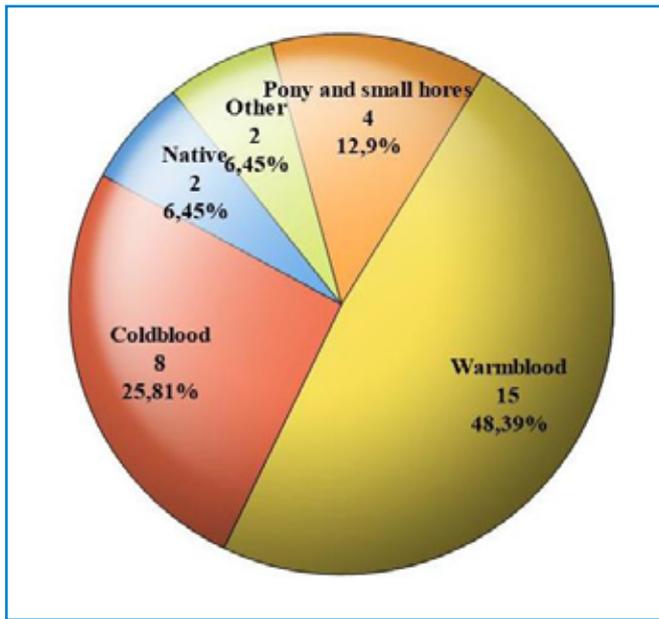


Figure 1. Distribution of breed type by breeding organisations

All together around 31K breeders have participated in the work of BO. A total of 150K animals are included in these organisations, comprising about 59K broodmares and 5,500 stallions (Table 1).

Results and discussion

Main use of the breed refers to the most important traits according to the economic use and breeding objectives (riding school, leisure, sport driving, agricultural work, milk production, etc.). For majority of BO, sport riding (33%) is the most important trait, followed by leisure, leisure riding, agriculture work, meat production, and leisure driving (Figure 2a). The questionnaire also provides possibility to select optional use of breed. The most important optional use of the breed is leisure driving (around 30%), followed by leisure riding, sport riding, meat production, and tourism (Figure 2b).

Most BO perform parentage verification for all registered animals (Table 2), however in some no parentage verification is used. Parentage verification method is based on the ISAG standard microsatellite (MS) test (62%) and own MS test (38%).

Table 1. Number of breeders, horses, broodmares, stallions, and foals.

Item	Mean	Std	Min	Max	Sum
Members/ breeders	1068.0	1,761.3	1.0	9,000.0	30,972.0
Horses	5,333.4	13,294.3	100.0	70,000.0	149,334.0
Broodmares	1,843.7	4,034.3	20.00	22,738.0	58,997.0
Stallions	171.0	247.6	4.0	1000.0	5,472.0
Foals per year	895.2	2,477.3	15.0	13,652.0	26,857.0

Table 2. Group of animals used for parentage verification by Breeding Organisation (BO).

Parentage verification	N1	%
Not in use	5	16.1
Breeding stallions	4	12.9
Breeding animals	2	6.5
All registered animals	20	64.5

¹N= number of BO.

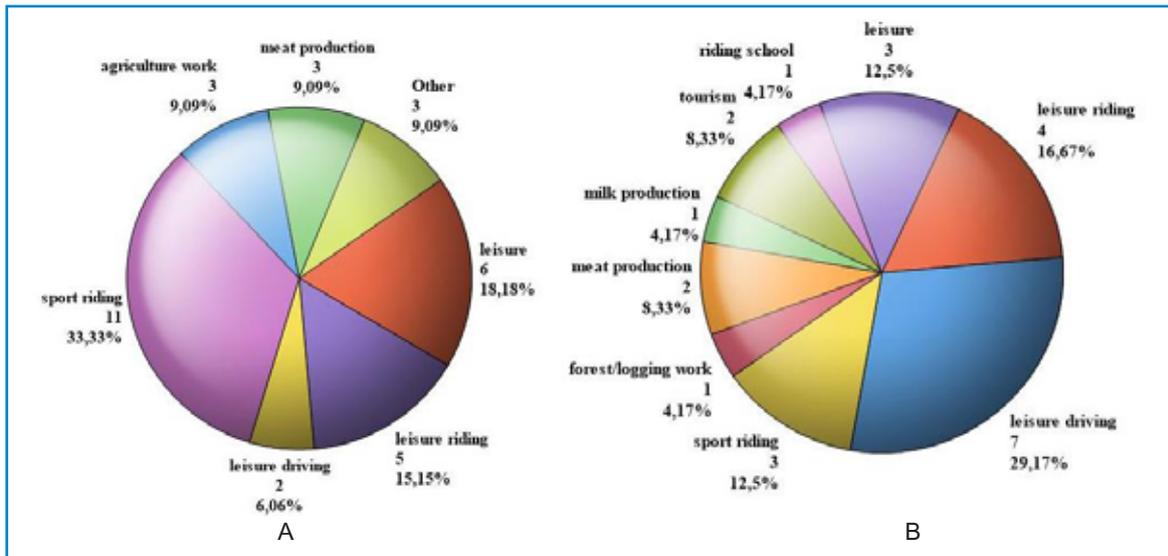


Figure 2a and 2b. Frequency distribution of traits according to main and optional use of the breed.

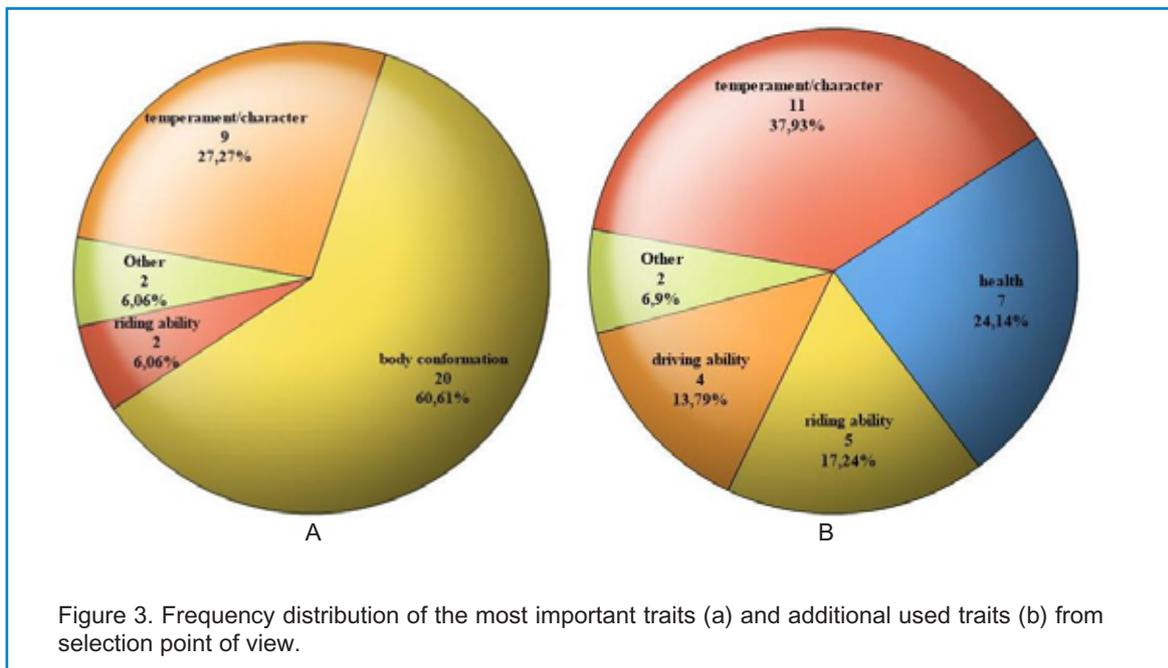


Figure 3. Frequency distribution of the most important traits (a) and additional used traits (b) from selection point of view.

Figure 3a and 3b. Frequency distribution of the most important traits (left) and additional used traits (right) from selection point of view

Table 3. Part of the population under performance recording.

Criteria	N ¹	%
Whole population	13	43.3
Animals selected for breeding	12	40.0
Part of population	3	10.0
Breeding females	1	3.3
Stallions	1	3.3

¹N= number of BO.

Table 4. Future parentage verification method.

Future parentage verification method	N	%
ISAG standard MS test ¹	18	58.1
Breed specific MS test ²	1	3.2
SNP based test ³	12	38.7

¹ISAG – International Society for Animal Genetics.

²MS – Microsatellites.

³SNP – Single Nucleotide Polymorphism.

From the selection point of view, body conformation (60%) is the most important selection trait (Figure 3a) followed by temperament/character (27%) and riding ability (6%). The additional traits important for selection purposes (Figure 3b) are temperament/character (38%), followed by health traits (24%), riding (17%), and driving ability (14%).

For selected traits, recording is performed mostly for the entire population (Table 3), followed by animals selected for breeding. In small proportion, it is used for only breeding females and stallions. Unfortunately, phenotype is still the most important criterion for selection (90%). Only 10% of BO performs genetic evaluation.

Questions regarding future plans or interests were related to parentage verification method (Table 4). It seems that genomics becomes more important in horse breeding since BO started to implement parentage verification using SNP based testing for all registered animals. Furthermore, the BOs are interested to include additional traits (body conformation and temperament/character) in the breeding program or in recording and selection in the future.

The results of the Survey, although not conclusive, are encouraging and show the great interest in harmonization under the CAR umbrella for almost all investigated traits. Feedback from the Survey will enable the Equid AC to determine current activities and potential future activities that might be facilitated by ICAR.

Conclusions

SAS Inst. Inc. 2009. SAS/STAT® 9.2 User's Guide, Cary, NC: SAS Institute Inc

List of References