The Development of a Sustainable Breeding Programme for the Irish Draught Horse

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1   Executive Summary

- The Irish Draught Horse breed, despite the utilisation of significant resources, suffers from the lack of a sustainable breed development programme that is aimed at both genetic improvement, and at the safeguarding of genetic diversity within the breed.

- The lack of planning is manifested by the fact that there are no clearly set out breeding objectives by either of the organisations who approve animals for breeding purposes, namely, the Irish Draught Horse Society, and the Irish Horse Board. The lack of breeding objectives undermines the ability of a quality control system such as mare or stallion inspections to play a meaningful role in breed development.

- Initial results from the RDS funded University of Limerick study into "Irish Draught Conformation" suggests there is no consistency in the evaluation methods used currently for either Irish Draught Mares or Stallion approvals. (the view of individual inspectors as to what an Irish Draught is and the attributes it requires for future function differs greatly).

- There is no question as to the expertise of the judges used by the Irish Draught Society or the Irish Horse Board, however the current trait based system allows for widely inconsistent results between judges on an individual animal.

- The current licensing of Irish Draught stallions for both the Irish Draught Stud book and the Irish Sport Horse Studbook does not explicitly favour the retention of individual breed characteristics and a separate identity for the Irish Draught. No research or planning has been carried out on the long term consequences of this system for either the Irish Draught or the Irish Sport Horse.

- The development of a sustainable breeding programme for the Irish Draught needs to be built around three components:
    1. The definition of a breeding objective
    2. Evaluation of an animal's ability to fulfil that breeding objective
    3. Design and implementation of a sustainable breeding programme to ensure the best animals are used to attain a given objective.

- The current situation prevailing within the Irish Draught Horse Society suggests that little meaningful engagement on a breed development programme can be made at this point.

- The recommendation of both the RDS/ICBF is that attention should be focused in the short term in storing genetic material that will safeguard genetic and breed characteristic erosion until such time as it can be used as part of a properly constructed breed development programme. In addition, other aspects that can ensure an increase in genetic diversity should be examined.

2 Introduction

The interim report on the development of a breed preservation plan for the Irish Draught Horse (IDH) (Kearney, 2005) outlined a genetic analysis of the IDH, and also the results of a breeder survey. The report highlighted several key issues such as the:

- large influence a few stallions have exerted on the breed
- availability of diverse stallions both within and outside of Ireland
- need to harmonise the recording of IDH world wide
- need to have routine monitoring of inbreeding
- high level of breeder enthusiasm for breeding IDH
- current breeding practices of the breeders
- future direction of the breed

The objective of this report is to build on the results of the previous report and outline the key aspects required to formulise a plan to ensure the future of the IDH. This report focuses on key aspects of how to develop and maintain a sustainable breeding programme that is vital for the future prosperity of the breed. Due cognisance of breeder's comments were taken into account in the preparation of this report.

3 Development of a sustainable breeding program for the Irish Draught Horse

Systems of livestock improvement are built around three key areas. These are: a) the definition of the breeding objective, b) the evaluation of an animal's ability to fulfil the breeding objective, and c) the design and implementation of a sustainable breeding programme to ensure that the best animals are utilised to attain the given objective. Each of these will now be discussed with reference to the IDH.

3.1 Definition of a breeding objective

In order to run a successful breeding programme it is necessary to define a breeding objective. The breeding objective is the goal of the breed improvement programme and, in general, the breeding objective focuses on maximizing profit or efficiency. The breeding objective may not necessarily be an economic one; however a reasonable assumption would be that most breeders will not stay in the business unless it is somewhat profitable to do so.

Currently there is no defined breeding objective for the IDH and consequently despite the utilisation of sizeable resources there can be no proper planning for the development of the breed.

It is of the utmost importance for those entrusted with the stewardship of the breed to urgently put in place a breed development plan for the Irish Draught.

A breed development plan should

1. Clearly set out breed objectives
2. Conduct a comprehensive audit of all breeding stock
3. Produce a measurable breed standard
4. Design a short term, medium term, and long term breed development programme based on breed objectives, current circumstances of the breed, and the breed standard
5. Engage in a proper communication programme that informs all breeders on both the breed objectives and the breed standard
6. Identifies the opportunities and threats afforded by changes in the wider Sport Horse market
7. Deals adequately with changes in European legislation

In order to define a breeding objective it is necessary to assess the current and future potential markets for a product to maximise profitability. Once these markets have been identified the next step is to breed animals that can fulfil the market needs. The first step for any future preservation of the breed is to identify the key markets that will maximise the profitability of the breed for its owners and breeders. In this respect the IDH should focus on markets that avail of the great strengths of the breed such as its versatility, temperament, conformation etc. A detailed cost-benefit analysis of the key markets needs to be undertaken to identify which markets should be targeted. Market research is an integral part of product promotion and in this respect the IDH is no different to any other product. Identifying what the markets are and want will be the key to survival for the breed in the future. Currently, there are several events which could be targeted for market research such as the RDS show, the national show, and the ID national sales. Analysis of the needs and wants of breeders, buyers and prospective owners should form the basis of the future direction of the breed. Extensive market research has been conducted by the RDS with regards the sport horse industry, and should be considered closely due to the close links between the IDH and the Irish Sport Horse (ISH).

Once the market(s) has been identified, a breeding objective can be formulated. The breeding objective is the focal point of any breed improvement programme. The purpose of the breeding objective is to set out criteria that will enable the identification of animals which have the highest merit for a particular trait or combination of traits that achieve the breeding objective. For example, the breeding objective of the ISH is "To produce a noble, modern, correct, sound and athletic sport horse with good basic paces, that is pleasant to ride and with a good temperament, capable of being used as a pleasure or performance horse, and capable of competing in showjumping, eventing and dressage at both national and international level." Once a breeding objective has been defined the traits that impact most on the breeding objective can be prioritised. In terms of the ISH the traits of highest importance are gaits, conformation and showjumping ability, with less importance on dressage and fertility. Similar rankings of traits can be found in the breeding objectives of world sport horse studbooks (WBFSH, 2006). The following section will deal further with the issue of trait importance and recording.

3.2   Evaluating Animals

In order to breed animals and attain improvement in the breeding objective it is necessary to evaluate animals for traits that will result in such improvement. A clear breeding objective should help identify the key traits that need to be focused on. Once these traits have been determined animals should be assessed for their abilities in each of these traits. For example, if the market requires an animal that conforms to a specific appearance or conformation then an objective visual appraisal of the breed characteristics needs to be determined. Objective appraisals can be very useful at identifying animals with strengths for particular traits. Linear inspection of cattle is used extensively to define many conformation traits. These traits can then be evaluated genetically to identify an animal's breeding value for a particular trait. Breeders wishing to improve certain traits can then select sires that are strong for those particular traits.

In the context of the IDH, an objective linear scoring system has several advantages. Firstly, it allows us to record valuable information on traits of importance to the IDH. This is vital to allow the evaluation of these traits in order to rank horses genetically. Second, several breeders commented on the lack of consistency and transparency in the inspection process. Subsequent work from the University of Limerick suggests that the current inspection process provides little consistency when evaluating animals (see Appendix A). Furthermore, to avoid being biased on the first impressions of a horse, judges in Sweden adjudicate on specific aspects of a horse rather than all aspects (Phillipson, personal communication), thereby providing a much more objective evaluation of the horse. Thirdly, the success of the linear scoring system can easily be judged based on the genetic trends for the traits.

Such a system would provide extremely valuable breeding information to breeders who wish to select stallions for their mare. For example, one could envisage a situation where a breeder would like to increase the bone of the offspring of a given mare. By determining how a stallion transmits bone to its offspring, a breeder can choose a stallion that will increase bone in the offspring if that is their objective. The same principle applies to all other conformation traits. In addition, other traits could be evaluated for the IDH such as its own performance and its progeny performance in a variety of equestrian disciplines where available.

Currently, there is very little information available to breeders on which to objectively rank stallions for different traits as values for specific conformation attributes such as "length of rein" are not published. Producing breeding values for stallions based on a linear assessment will provide lots of variation for the breeder to make their decisions. Also, this variation will be very important for the future of the population as our ability to correct any weaknesses that arise may be compromised. Finally, this system should go along way to allaying breeder concerns surrounding the current system of inspections.

3.3 Design and operation of a sustainable breeding programme

The third key area of a breeding improvement programme is to design a breeding scheme that will maximise the long-term genetic improvement for a given breeding objective. A good breeding scheme should achieve genetic improvement without reducing the genetic variation of the population. In the context of a breed where the numbers are small, greater attention needs to be paid to the variation in the population. Several tools exist for the maximisation of genetic merit while controlling inbreeding to a predefined level (Meuwissen, 1997). Several European studbooks are currently looking at the implementation of this approach (personal communications). Most genetic gain in any livestock species comes from the identification and proliferation of exceptional males. Because the sire can have so many more offspring per year than the dam, he is a more important individual than any one female so far as the whole population is concerned. Both are equally important when it comes to any one particular offspring. Therefore, it is clear that the selection of the stallions that will be used as sires is critical for both the short and long term success of the breeding programme.

Once the breeding objective has been decided, the traits of importance recorded, and animals evaluated for these traits, individuals with the highest merit should be chosen to sire the next generation. In the context of maintaining diversity in a small population it is necessary to try and have a balance in the use of these stallions. Unequal use of stallions increases the risk of reducing genetic diversity. It is often the case that we can forgo a small loss in genetic gain to ensure genetic diversity is maintained. There are a number of ways in which this can be achieved for a small population such as the ID. These include:

1. Colts with a low relationship to the current population could be highlighted for their "diversity value" from birth. These foals should all go through the stallion approval process to ensure they are not lost for whatever reason.
2. Approve more stallions from diverse bloodlines.
3. Target matings between stallions and mares that would produce animals with good genetic merit but also animals with good diversity.
4. Allow the offspring of stallions from different sections of the studbook (either supplementary registered stallions or RID stallions standing in other countries) to be eligible to achieve fully registered status provided they pass the inspection process. Currently, offspring of stallions other than RID, are not eligible to achieve RID status. There is little merit in this approach as it imposes a needless barrier to the expansion of the gene pool. An agreement with the Irish Horse Board was reached with regard a select number of S1 and RID GB stallions, and serious consideration should be given to extending this. This is especially true for RID stallions standing in other countries as these are, on average, less related to the Irish mare population than the Irish stallions (Kearney, 2005). This will allow breeders who wish to use these stallions, for whatever reason, to do so. A quality control system is in place to ensure the quality of animals reaching RID status. In addition, it allows an offspring to be judged on its own merits rather than

being discriminated against by virtue of the position its parents hold in the studbook.

Some or all of these possible ways to increase diversity are under consideration by several other studbooks throughout Europe.

4   Requirements for the development of a sustainable breeding program

The two critical elements of operating a successful breeding programme are good pedigree and data recording. These are required to conduct an accurate genetic evaluation of the animals. Currently, the pedigree recording is of a very high quality, with DNA parentage verification compulsory for the registration of foals. This means that parentage errors are negligible. If a linear scoring system was adopted in place of the current approach, valuable data on individual traits could be collected at the time of inspection for little or no extra cost.

When enough data has been collected, the next step in the process is to estimate heritabilities and genetic correlations for the traits. These parameters are required to determine how much a trait is influenced by genetics and the environment. For example, some traits such as conformation generally have moderate to good heritability while fertility traits have lower heritabilities and are heavily influenced by the environmental conditions. In addition, traits can be correlated with, for example, sale price. Such an exercise would be useful in determining if a relationship existed between certain traits and sale price. This would give a good indication of what the market wants, and the breeding objective can be subsequently changed to reflect this if necessary.

Once the heritabilities have been estimated, the breeding values for animals can be calculated. This will allow animals to be ranked according to the breeding objective. The amount of information collected can be used to estimate the reliability of the breeding value (i.e., how much we can expect the breeding value to change when more information becomes available). For stallions with lots of progeny the reliability is usually high such that we would not expect the breeding value to change much with the addition of more information.

The publication of the breeding values for stallions will allow a breeder access to invaluable information when choosing a stallion. Education of the breeder on the best use of breeding values will be crucial to the success of the breeding programme. The use of such information can appear daunting at first but with the correct education and interpretation they can become a powerful tool with which to select animals. The success of this approach can be seen in almost all livestock species.

Methods and software for such tasks as described above are readily available. Systems such as this have been in place in almost all selected livestock species, including horses. These methods have proved very powerful, with rapid gains in genetic merit for the traits under selection. It is certain that such a system, operated correctly, would serve the IDH successfully long into the future, not only by improving the genetic

merit of the population but also maintaining or increasing the diversity of the population. Such a system is currently in operation for the ISH, and many European sport horse studbooks. It is also in agreement with the FAO guidelines for the development of an *in-situ* conservation strategy for rare breeds (FAO, 2000).

5   Recommendations

Based on the work completed, there is a clear and urgent need to put in place a sustainable breeding programme for the IDH. This will ensure that the breed can supply suitable animals for the markets that will sustain the profitability of the breeders. It also will allow the structured management of the population to ensure improvement in genetic merit, and also genetic diversity. The two keepers of the breed, the Irish Draught Horse Society and the Irish Horse Board, have an obligation to ensure the long term survival of the breed, and should look to put in place structures that will enable the formation of a breeding programme based on sound scientific principles without delay.

The expertise and technical requirements to operate a breeding programme are available to help in the design and implementation of a breeding programme. However, the success of a breeding programme will be based on the co-operation of all stakeholders involved. Of utmost importance is to identify what the key markets are for the breed and to define a suitable breeding objective to meet these markets. The successful implementation of a linear scoring system will enable the objective assessment of individual animals and their conformity to breed standard. The result will be a lot more information for breeders, greater transparency, and a lot more choice when selecting stallions.

In the meantime, immediate consideration should be given to some of the measures outlined in section 3.3. Colts with good diversity values should be identified and flagged at birth and be brought through to the stallion approval process. In addition target matings that would result in foals with good diversity values should be investigated. The freezing of semen from stallions that represent rare bloodlines would also ensure that such semen is available for a breed development plan in the future and would be merited it in the current situation. Finally, consideration should be given to embryo transfers from genetically interesting mares and those mares with superior conformation.

The argument put forward against preservation is that the market does not support the objective of that preservation, and it undoubtedly does not in the short term.
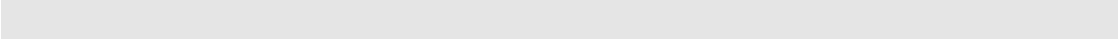
6   References

FAO, 2000. Secondary guidelines for development of farm animal genetic resources management plans; Management of small populations at risk. Domestic Animal Diversity Information System version 2.0, (http://dad.fao.org/dad-is/reference), FAO, Rome.

Kearney, J. F. 2005. An interim report on the development of a breed preservation plan for the Irish Draught Horse. *ICBF project report*.

Meuwissen, T. H.E. 1997. Maximizing the response of selection with a predefined rate of inbreeding. *Journal of Animal Science*, 73:934-940

World Breeding Federation of Sport Horses (WBFSH). 2006. http://www.wbfsh.org/; Subject: Interstallion.

7   Appendix A

Royal Dublin Society and University of Limerick Irish Draught Study. E. Breen et al.

The RDS is currently working with the Life Science Department in the University of Limerick on a study examining approaches to the evaluation of conformation of Irish Draught horses. One of the aims of this study is to compare the use of a subjective and a linear scoring approach to conformation evaluation.

Subjective evaluation is the Irish approach to evaluating conformation traits considered important for breeding and performance. The basis of subjective scoring is that the judge is asked to use their knowledge and experience to score different aspects of an animal on a numerical scale, in essence to express an opinion on whether a trait is good or bad in relation to the judges' vision of the ideal trait. This is the current approach of the Irish Draught Horse Society for the examination of Irish Draught mares for entry into the studbook and the Irish Horse Board for stallion approval.

The linear scoring system is a more comprehensive and objective method of evaluating conformation. The linear classification system was developed in the late 1970's as a means of standardising assessment techniques for cattle breeding. The system was established to score conformational traits on a linear scale from one biological extreme to the other as an alternative to scoring the animal in relation to an ideal. The system has proved extremely successful for cattle breeding organisations across the world and has allowed organisations to provide their breeders with valuable information on conformational traits to support a more selective breeding programme for these traits. The same approach has been adopted by the KWPN studbook who introduced a linear classification system to their breeding programme in 1989.

The linear scoring system operates in a detailed and descriptive manner which ultimately facilitates more selective breeding for a predetermined breed standard. The linear scoring system is more comprehensive in that it deals with approximately 20 conformational traits where as the traditional Irish system deals with 8 The linear approach could assist in the monitoring of specific traits for the Irish Draught, for example the trait 'foreleg'. From data obtained at inspections it could be established what proportion of Irish Draughts examined are back at the knee. This information would allow the appropriate authority to decide whether there is an issue with Irish Draughts being back at the knee and more importantly it could identify stallions that could be used to correct the fault. The traditional subjective approach does not provide this level of detailed information to either the breed authority or individual breeders. As all mares have different strong and weak points, the more comprehensive the information the greater its value to individual breeders.

The objective of the RDS Irish Draught study is to compare the subjective scoring sheet with the linear scoring sheet using a highly experienced judging panel. A total of 22 judges were involved – 8 Irish Draught judges, 8 Irish Sport Horse judges, 2 English Irish Draught judges and 1 foreign judge. A sample of 22 Irish Draught mares, indicative of the breed, was evaluated by the judges and each judge scored each mare independently with both scoring approaches. Some of the data gathered on the day is displayed in the graphs below.
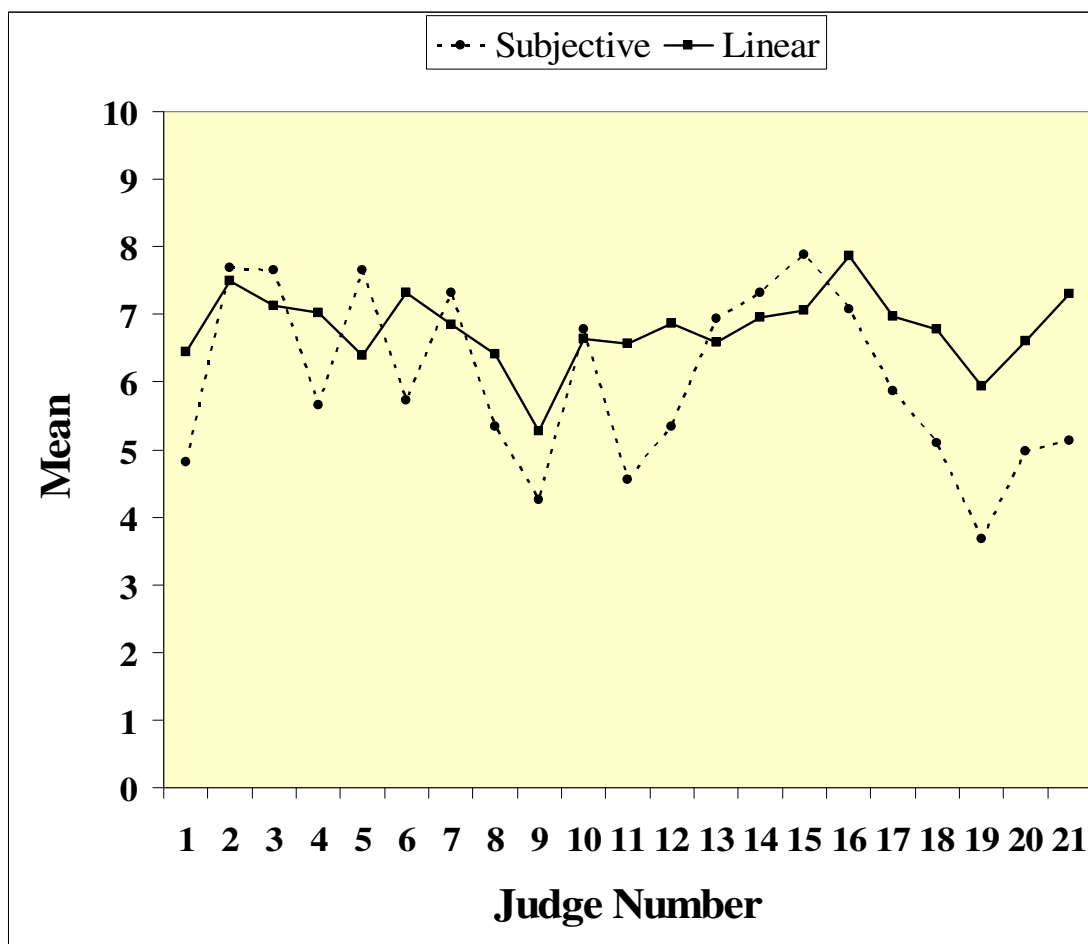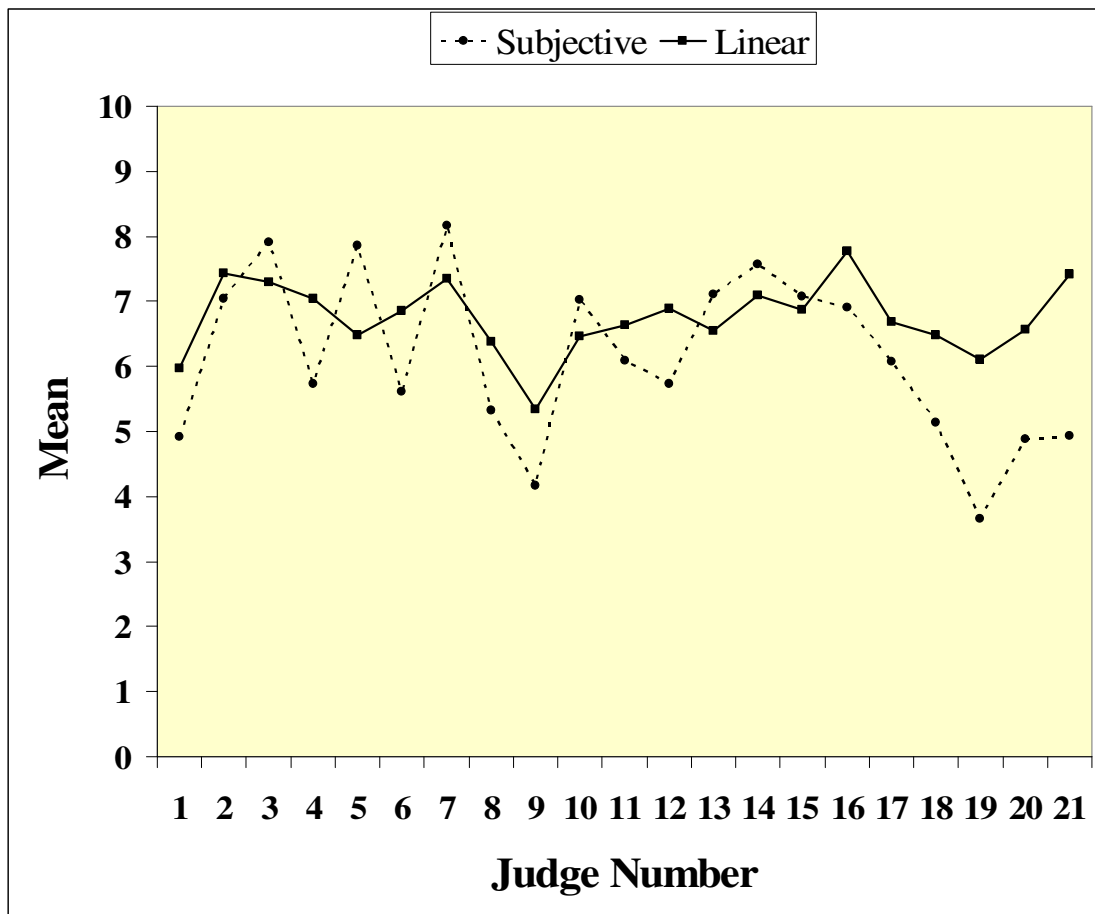

Figure 1 Mean for the trait 'Foreleg'

Figure 2 Mean for the trait 'Hindleg'

The graphs represent the mean scores for each judge for the traits foreleg and hindleg for all 22 mares involved in the study. The graphs illustrate that there is variation in the mean scores for both subjective and linear scoring approaches; however the graphs would suggest that the linear classification system is more consistent for these traits. The linear scoring system has proved successful for the KWPN studbook whose systematic approach ensures a strict uniformity among judges, where training has ensured that even a discrepancy of 1 mark between judges does not occur. However the KWPN studbook has a specific breeding objective and a definition of a breed standard in place which gives clear direction to both breeders and judges and supports the use and advantages of the linear classification system in evaluating both conformation and performance traits.

The variation in subjective scores shown graphically above for the sample of Irish judges reflects a lack of consistency that is inappropriate for its continued use as an evaluation process for Irish Draughts. The Linear System for these traits shows an improved level of consistency. However there still remains an unacceptable level of variation between judges, it should be taken into consideration that the judges involved in the study received no training for the linear scoring system prior to the day it was examined and the system was used to evaluate the horses without any

consensus on what the Irish Draught breed standard is. It should be expected that consistency would improve with training in the linear scoring method and a clear understanding amongst both ID and ISH judges of what comprises the ID breed standard.

In view of the success of the linear classification system in Dutch breeding and in cattle breeding practices the implementation of the system into the Irish Draught breeding program could be valuable. The current study is aimed at examining its use for the Irish Draught breed and to put in place the foundations for the development of a system specific to the Irish Draught horse.