An Interim Report on the Development of a Breed Preservation Plan for the Irish Draught Horse

By

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1 Executive Summary

- This report outlines the results from Phase 2 of the Irish Draught Horse (IDH) breed preservation plan. This phase of plan deals with the breed structure, the main aim being to analyse the genetic relationships within the IDH population and to examine the some of the breeding practices currently undertaken by breeders. Results of this phase will underpin the next phase of the project looking at the evaluation of the breed preservation options. Specifically, this report outlines; a) the genetic relationships of active stallions standing in Ireland, Great Britain (GB) and the USA to the current mare population; b) the genetic relationship of supplementary registered (S1) ID stallions to the current mare population; c) the genetic relationship of active stallions, S1 stallions, and the mare population to three very influential stallions, namely, Clover Hill, King of Diamonds, and Pride of Shaunlara. This report also outlines the results of a survey of IDH breeders on current breeding practices and the future development of the breed.
- There is a clear need to harmonise how ID horses are recorded across IDH studbooks to ensure accurate pedigree recording of animals across countries. This will be very important if a routine assessment of the genetic diversity of the population is to be undertaken. A centralised 'worldwide' studbook that registers all ID animals would be the ideal solution. However, if this is not possible then, at the very least, animals that appear in more than one studbook should be identified using the same identification number across studbooks.
- Fully approved Registered Irish Draught Stallions showed a mean relationship to the female Irish Draught population in the range of 0.3% to 6.35%.
- Only 11 RID stallions have a mean relationship of less than 1% to the female population
    - 4 of these stallions are standing in Ireland, the remaining 7 standing in England
    - Stallions range from the age of 13 to 20 (8 of the 11 stallions are aged 17 or over)
- 4 of the 5 stallions with the lowest mean relationship to the female population are non-Irish standing
- Only 6 RID stallions are complete outcrosses (i.e. 0% relationship) to Pride of Shaunlara, King of Diamonds and Clover Hill;
    - Bridgeford Stockbroker 1989
    - Come T 1996
    - Coolehane Flight 1985
    - Gortlea Ruler 1986
    - Grove Warrior 1986
    - Amber Glen 1987
- Section 1 Irish Draught Stallions showed a mean relationship to the female population in the range of 0.6% to 5.37%

- There are several S1 stallions with a low mean relationship to the Irish breeding mare population that could be used to increase the genetic base of the population

- Results from the survey showed that interest levels in IDH breeding is high and most want to see the breed preserved and developed in the future. There are many uses for the IDH and certain characteristics are more important than others. Many breeders would like to use more outcross stallions but are hindered by the lack of availability and logistical constraints. The results show that a number of breeders have used A.I. previously. About 70% of responses said they would like to see the IDH developed at both foundation and performance level.
- Given the level of relatedness of the population to both the King of Diamonds and Pride of Shaunlara it is imperative to identify ID stallions that are not related to these two stallions. Currently certain studbook rules are in place that discourages the use of ID stallions standing in other countries and the use of S1 stallions. Changes to these rules may help increase the genetic diversity of the population. We would also see A.I. playing an important role in the maintenance and future development of the breed. These, along with other aspects will be examined more closely in the next phase of the study.

2 Introduction

The Irish Draught is an indigenous breed of horse and a valuable national asset. It is currently listed in the FAO's World Watch List for Domestic Animal Diversity (WWL-DAD) with the risk status 'endangered maintained' because of a declining population trend (FAO). This implies that though not in immediate danger of extinction, the survival of the breed would require a concerted effort to arrest the negative trend in population size.

An analysis of the IDH pedigree file (Olori, 2004) has confirmed a declining trend in registration along with increasing levels of inbreeding by year. On the basis of this a 5 Phase breed preservation plan was drawn up and commenced. The primary objective of this phase (Phase 2) was to understand the breed structure and population dynamics of the IDH population.

One of the recommendations from the report of Olori (2005) on the relationship between mares and stallions in the Irish Draught (ID) breeding population was that bloodlines should be sourced from where ever possible in order to broaden the genetic base. The purpose of this study was to incorporate information from the Great Britain (GB) and USA Irish Draught studbooks to determine if stallions standing in these countries could be used to increase the genetic base of the ID. We also looked at the relationships between S1 stallions and the current breeding mare population, and looked at the relationship of current breeding ID (stallions and mares) to three influential stallions of the breed; Clover Hill, King of Diamonds, and Pride of Shaunlara.

In addition, this report also includes results from a survey of IDH breeders. The purpose of the questionnaire was to gather information on current breeding practices and give the breeders an oppourtunity to provide their opinion on the potential future directions for the breed.

3 Materials and Methods

3.1 Pedigree File

The pedigree file of Olori (2004), which was obtained from the Irish Horse Board (IHB), was used as the base pedigree file. The file contained a total of 13533 animals. In addition pedigree files were received from the ID studbooks in the UK and the USA. The most important aspect of this study was to ensure that as many links as possible be made between each of the studbooks to get meaningful results. The first step therefore was to cross reference both and GB and USA pedigree files with the Irish pedigree file. Where an animal was found in both studbooks, the information present in the Irish pedigree file was used and the animal was eliminated from the other pedigree file. Each country has unique identifiers for animals and their parents, therefore cross referencing used a combination of variables to match animals. For example, in the Irish pedigree file RID stallions had a unique identifier whereas in the GB studbook the sire's identity was the 3 digit RID number assigned by the IHR. Records were also matched on name. The USA studbook did not have any unique identifier for sire or dam therefore cross referencing was based on animal name. A

further cross referencing step was done to update any missing sire and dam pedigree information in the Irish pedigree file. After cross referencing there was a total of 7048 records in the GB pedigree file and 102 records in the USA pedigree file. In order to run the analysis it was necessary for all sires and dams to also have an animal entry in the pedigree file. These were created, with unknown parents where no ancestral information was available, giving a total of 22542 animals in the final combined pedigree file.

3.2 Breeding Populations

3.2.1 Active Stallions

A list of active stallions for breeding was obtained from the respective ID societies. In total, 186 stallions were eligible for breeding, with 102 stallions standing in Ireland, 53 stallions standing in GB and 31 stallions standing in the USA.

3.2.2 Mare Population

Potential breeding mares were identified from the Irish pedigree file. These were mares that were classified as 'RID' mares born from 1990 onwards. In total 1229 mares were identified.

3.2.3 S1 Stallions

A list of 86 S1 stallions available for breeding was obtained from the RDS.

3.3 Computation of relationships and pedigree completeness

A file was prepared with a list of the breeding populations of interest and an algorithm was used to calculate the relationships directly from the pedigree file. This is equivalent to the MRELs system (Olori and Wickham, 2004) used previously but eliminates the need to calculate phantom progeny.

A pedigree completeness index (PCI) at the 3rd generation was calculated for each sire to determine the number of ancestors in the back pedigree of each sire. The PCI is calculated relative to animals with 3 generations of complete pedigree information. For example, an animal has 8 ancestors (great-grandparents) in the 3rd generation of its pedigree. If all 8 ancestors are known the PCI is one. If one ancestor is missing the PCI is 0.875 and so on. This is important to assess the quality of the pedigree information.

3.4 Survey of Irish Draught Horse breeders

A questionnaire was drawn up (Appendix A) and a survey of breeders was conducted by telephone (where a breeder's number was known) and by mail. A total of 400 responses were received.

4 Results

4.1 Analysis of the relationships of RID stallions from Ireland, GB, and USA to the current mare population

4.1.1 Pedigree Completeness

Figure 1 gives the average PCI for stallions by the country in which they are standing. The stallions in the USA had the greatest amount of pedigree information in the 3rd generation (0.9), followed by GB (0.85) and then Ireland (0.8). The maximum PCI was one in each country and the minimum was 0.5, 0.42 and 0.65 for Ireland, GB, and the USA respectively. A complete listing of stallion PCI are in Appendix B.

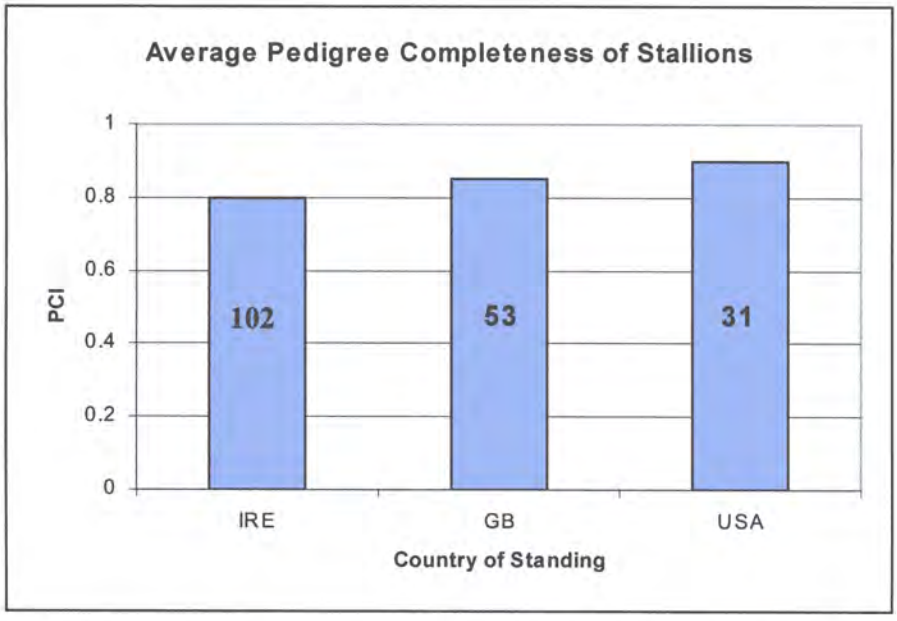


Figure 1. Average pedigree completeness index of active stallions standing in Ireland, Great Britain and the USA.

4.1.2 Inbreeding

The average inbreeding for the stallions is shown in Figure 2. In general the inbreeding of the stallions is low (<1%) and is lowest for Irish stallions (0.46%) followed by GB stallions (0.53%) and then USA stallions (0.72%). The minimum inbreeding was 0% in each country and the maximum was 6.3%, 3.6% and 6.6% for Ireland, GB, and the USA respectively. A complete listing of stallion inbreeding coefficient is in Appendix B.

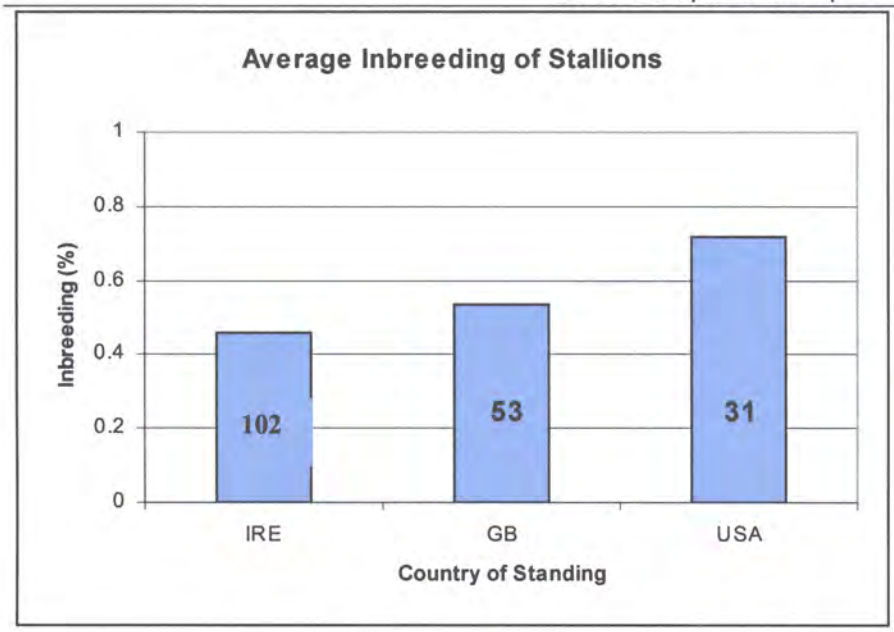


Figure 2. Average inbreeding of active stallions standing in Ireland, Great Britain and the USA.

4.1.3 Mean Relationship of stallions to mares

The relationship of individual stallions to mares in the breeding population ranged from 0 to 59%. The inbreeding of an offspring is equal to half the relationship between two parents. Approximately 1.5% of stallion/mare pairing had a relationship of 20% or greater, which would result in foals with an inbreeding of over 10%. The mean relationship of each stallion to all mares in the breeding population is presented in Appendix B. This ranged from 0.3% to 6.35%. Table 1 shows the top 5 most and least related stallions to the breeding mares. The top 5 have a mean relationship of 5% or more, implying they share 5% of their genes with all mares in the breeding population. The five least related stallions are related to the breeding mares by less than 1%.

Table 1. The 5 stallions with the most and least genes in common with mares in the breeding population

Stallion Name	Country	PCI	Mean Rel %
Top five stallions			
GLIDAWN DIAMOND	IRE	0.68	6.35
KILDALTON KING	IRE	0.68	6.18
FLAGMOUNT KING	IRE	0.58	5.19
CROSSTOWN DANCER	IRE	0.91	5.18
SHAUNAS DIAMOND	GB	0.92	5.14
Bottom five stallions			
CORK ARTHUR	GB	0.69	0.008
BALLYKNOWE PRINCE	GB	0.75	0.006
BRIDGEFORD STOCKBROKER	IRE	0.83	0.005
KENSONS ARAGORN	GB	0.77	0.004
GROVE WARRIOR	GB	0.42	0.004

It is interesting to note, that the top 5 stallions most related to the breeding population are descendants of King of Diamonds, and this is despite the fact that they do not have 3 full generations of pedigree. This indicates quite a degree of influence of the King of Diamonds in the breeding mare population. More results on this are presented later.

Figure 3 gives the mean relationship of stallions to the mares by the country in which the stallions are standing. Not surprisingly, the Irish stallions (2.93%) are most related to the mare population followed by the USA stallions (2.48%) and lastly the GB stallions (2.23%). This suggests that stallions other than those standing in Ireland should be used to broaden the genetic base of the Irish Draught Horse population.

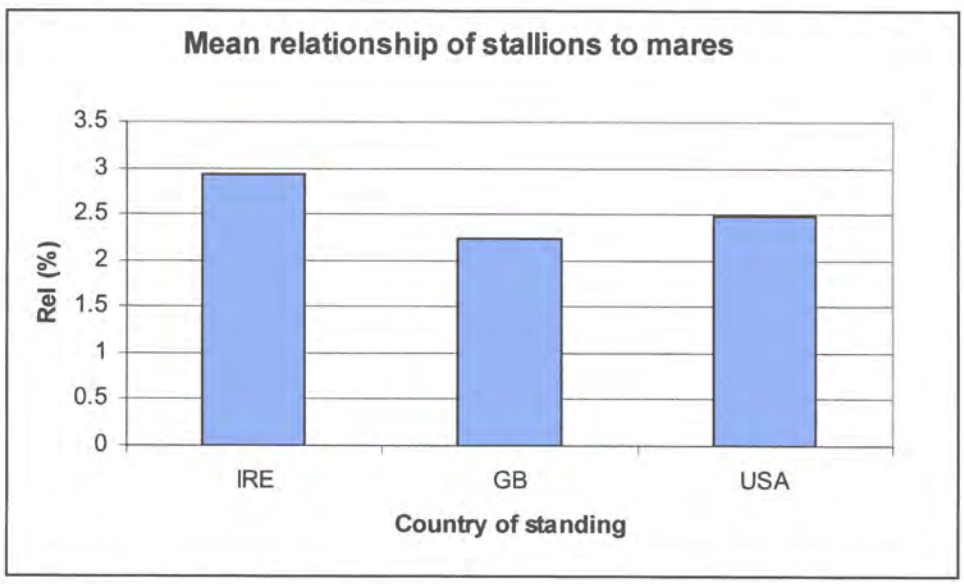


Figure 3. Mean relationship of active stallions standing in Ireland, Great Britain and the USA to the Irish breeding mare population.

The percentage of stallions for the 4 quartiles based on mean relationship is shown in table 2. For stallions standing in Ireland the greatest percentage of stallions (37%) was in the upper quartile, while stallions in GB (13%) and the USA (13%) had the lowest percentage in the upper quartile. This is not surprising as they will be some degree of distance between the stallions standing in these countries and the Irish mare population due to the restrictions placed on the use of stallions standing in foreign countries. This again emphasises the fact that there are stallions, not only in Ireland but also in GB and the USA of sufficiently different genetic backgrounds to the mare population that should be used to broaden the genetic base of the ID population.

Table 2. Interquartile range for the mean relationship of stallions standing in Ireland (IRE), Great Britain (GB) and USA with the breeding mare population in Ireland.

	Interquartile Range (Mean Rel %)			
	0-1.7	**1.7-2.6**	**2.6-3.5**	**3.5-6.3**
IRE	18	23	21	37
GB	34	26	26	13
USA	26	32	29	13

Figure 4 shows the average relationship of mares to stallions by the year of birth of the mare. Over the last decade or so the average relationship of the mares to the stallions has increased from 2.6% to 3.5%, meaning that the current offspring are more related to the stallions. This increase is reflected in the increase in inbreeding in the population as reported by Olori (2004).

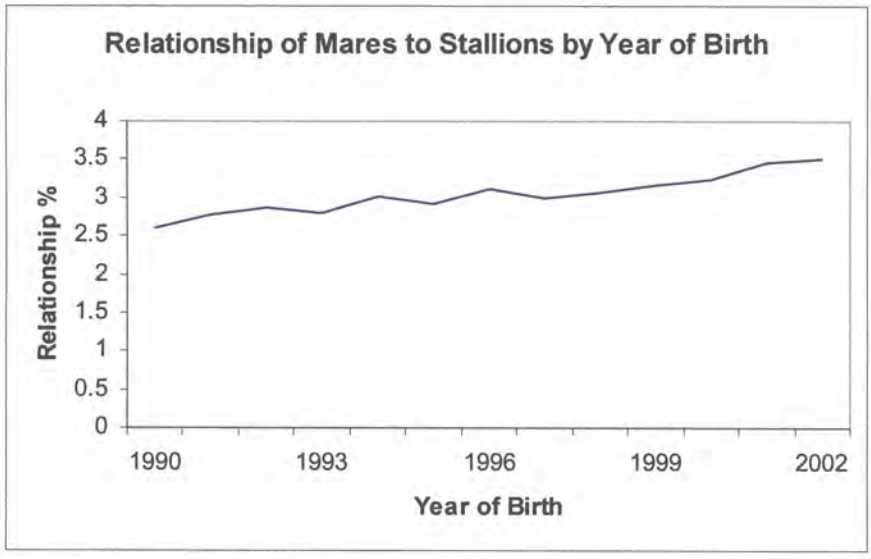


Figure 4. Mean relationship of mares to stallions by year of birth of mares.

4.2 Analysis of the relationships of S1 stallions to the current mare population

4.2.1 Pedigree Completeness

The average PCI for the 86 S1 stallions was 0.877, indicating that, on average, 1 great-grandparent was missing. A complete listing of S1 stallion PCI are in Appendix C.

4.2.2 Inbreeding of stallions

In general the inbreeding of the stallions is low (0.5%) and with a minimum of 0 and a maximum of 4.7%. Approximately half of the stallions were not inbred. A complete listing of stallion inbreeding co-efficient is in Appendix C.

4.2.3 Mean Relationship of S1 stallions to mares

The relationship of individual S1 stallions to the mares in the breeding population ranged from 0 to 53%. The mean relationship of each stallion to all mares in the breeding population is presented in Appendix C. This ranged from 0.6% to 5.37%. Table 3 shows the top 5 most and least related stallions to the breeding mares.

Table 3. The 5 S1 stallions with the most and least genes in common with mares in the breeding population

Stallion Name	PCI	Mean Rel %
Top five stallions		
Las Vegas Diamond	0.96	5.71
Diamond Cracker	0.91	5.06
Belclare Cross	1.00	4.94
KEC Diamond Millennium	0.92	4.92
Glid Uibhall	0.96	4.86
Bottom five stallions		
Luke Skywalker	0.92	1.35
Grey Laughton	0.60	1.21
Allen Rock	0.74	1.17
Arthurs Gold	0.87	0.71
Young George	0.91	0.65

The top 5 stallions most related to the breeding population are again descendants of King of Diamonds. Again, this indicates quite a degree of influence of the King of Diamonds in the breeding mare population.

4.3 Analysis of the relationships of ID populations to Clover Hill, King of Diamonds and Pride of Shaunlara.

4.3.1 Active Stallions

The relationship between the active stallions and the 3 stallions of interest is in Table 4. Of the 186 active stallions 180 are related to either the King of Diamonds or Pride of Shaunlara while only 23 stallions are related to Clover Hill. It is not surprising that the numbers related are the same for King of Diamonds and Pride of Shaunlara are the same as these horses are related to each other. The mean relationship to the stallions was similar for King of Diamonds and Pride of Shaunlara, but the mean relationship of the active stallions was only 2.5% to Clover Hill. King of Diamonds has 34 grandsons while Pride of Shaunlara has 30 and Clover Hill 11.

Table 4. Number of active stallions related to, the mean relationship, and the number of grandsons of King of Diamonds, Pride of Shaunlara and Clover Hill.

	No. related	Mean Rel %	No. > 25%
King of Diamonds	180	8.9	34
Pride of Shaunlara	180	8.6	30
Clover Hill	23	2.5	11

The stallions not related to Clover Hill, King of Diamonds, or Pride of Shaunlara are Bridgeford Stockbroker, Come T, Coolehane Flight, Gortlea Ruler, Amber Glen and Grove Warrior. Come T is the only stallion to be approved by the IHR that is not related to these 3 stallions since performance testing has been implemented in 1995. Currently four of the stallions are standing in Ireland and approved by the IHR, while Amber Glen and Grove Warrior are standing in GB. It should also be mentioned that there are several other stallions that share very little genes in common with these three stallions (e.g Huntingfield Rebel, Mountain Pearl, Kenson's Aragorn).

4.3.2 S1 Stallions

The relationship between the S1 stallions and the 3 stallions of interest is in Table 5. All the S1 stallions are related in to King of Diamonds and Pride of Shaunlara, where as only 25 of the S1 stallions are related to Clover Hill. The mean relationship to the stallions is similar, with Clover Hill having more S1 sons than either of the other 2 stallions.

Table 5. Number of S1 stallions related to, the mean relationship, and the number of grandsons of King of Diamonds, Pride of Shaunlara and Clover Hill.

	No. related	Mean Rel	No. > 25%
King of Diamonds	86	8.3	16
Pride of Shaunlara	86	8.6	10
Clover Hill	25	8.3	17

4.3.3 Irish Draught Mares

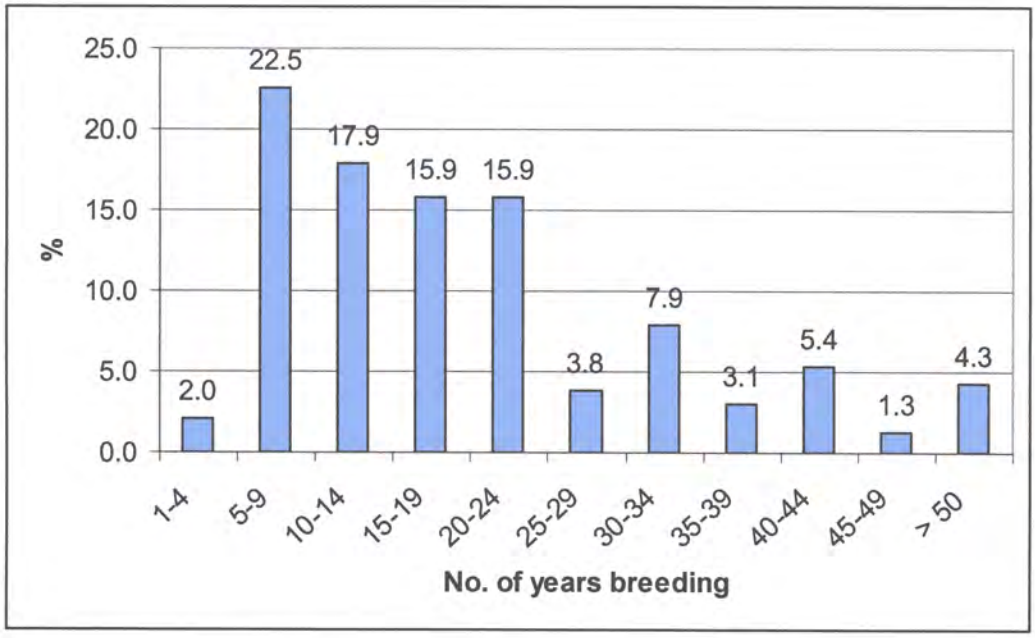
The relationship between the active breeding mares and the 3 stallions of interest is in Table 6. Almost 98% of all breeding mares in the population are related to either the King of Diamonds and Pride of Shaunlara, where as only about 18% of mares are related to Clover Hill. The mean relationship of the mares to the stallions is, 7.2% for King of Diamonds, 6.6% to Pride of Shaunlara and 2.5% to Clover Hill. Clover Hill has 83 grand-daughters in the population, compared to 109 for Pride of Shaunlara, and 136 for King of Diamonds.

Table 6. Number of S1 stallions related to, the mean relationship, and the number of grandsons of King of Diamonds, Pride of Shaunlara and Clover Hill.

	No. related	**Mean Rel**	**No. > 25%**
King of Diamonds	1205	7.2	136
Pride of Shaunlara	1205	6.6	109
Clover Hill	223	2.5	83

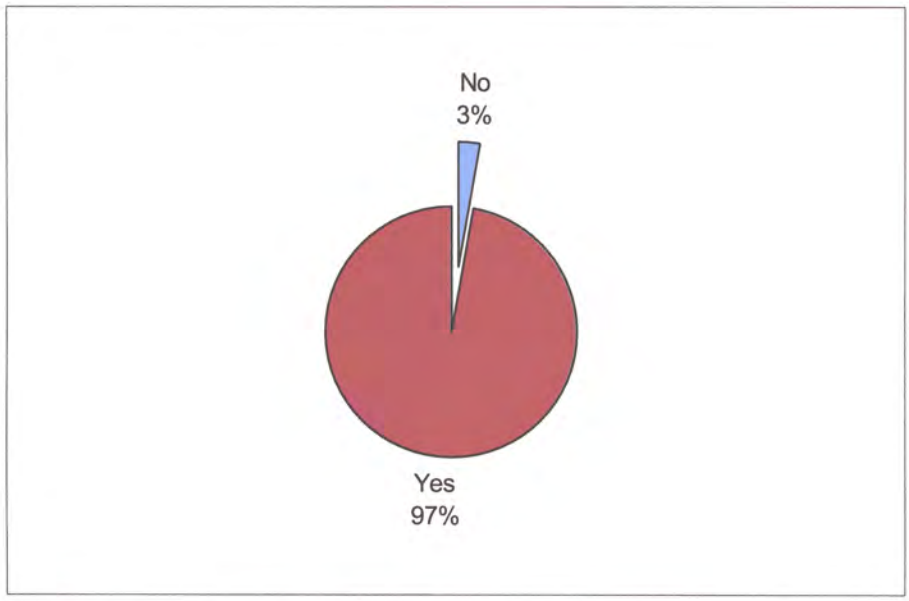
4.4 Survey of Irish Draught Horse Breeders

Q1: How many years have you been involved in Irish Draught Horse Breeding?



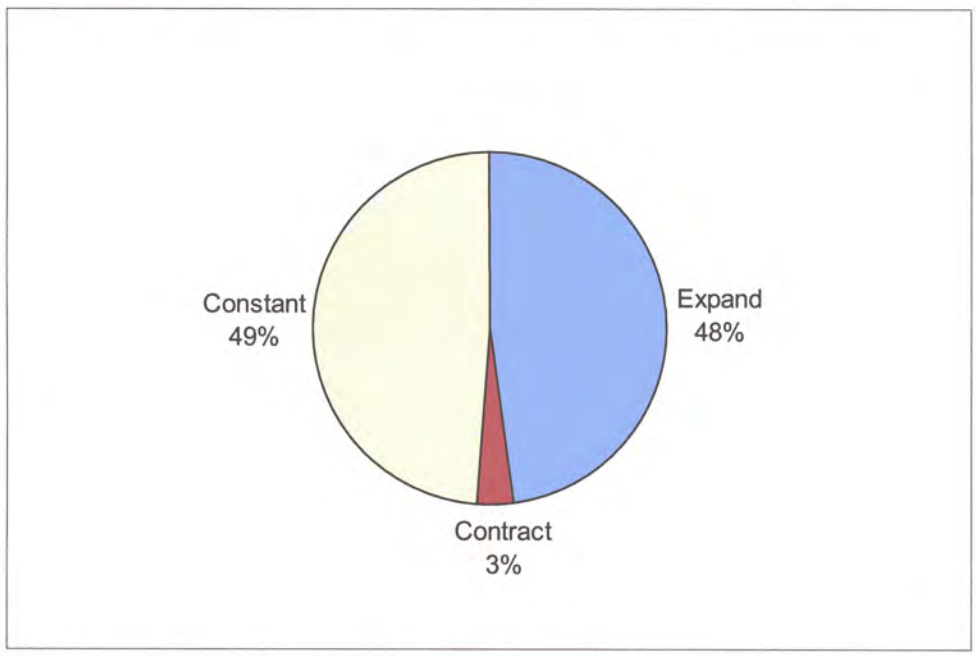
This figures shows that the vast majority of breeders (72%) have been breeding draught horses between 5 and 25 years. Only 2% or respondents have been breeding for less than 5 years.

Q2: Do you intend to remain an IDH breeder in the foreseeable future?



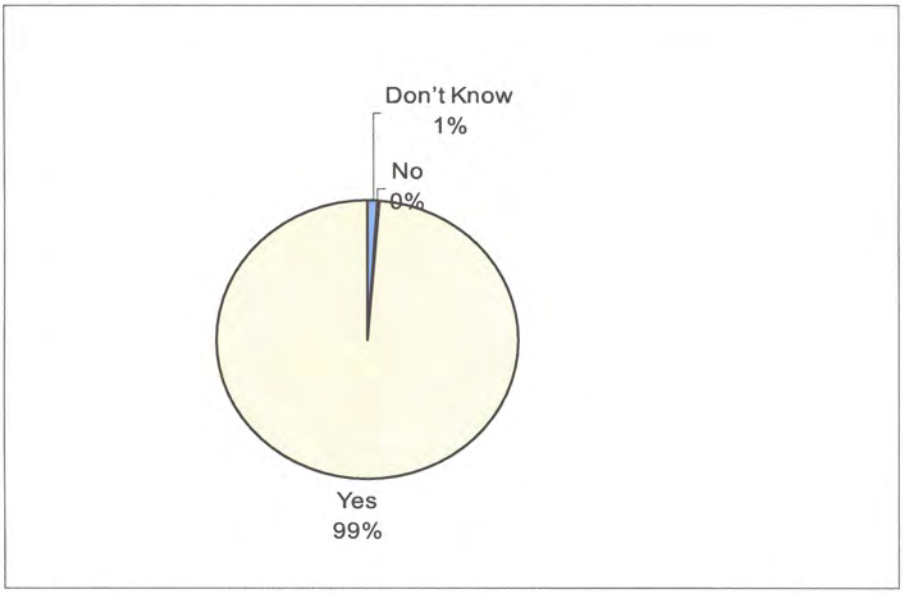
The figure shows quite clearly that almost all respondents intend to remain in IDH breeding

Q3: If yes, do you intend to expand, contract, or stay constant?



Approximately equal numbers of respondents are going to stay constant or expand in the foreseeable future, while only 3% said they are going to contract.

Q4: Would you like to see the IDH conserved?



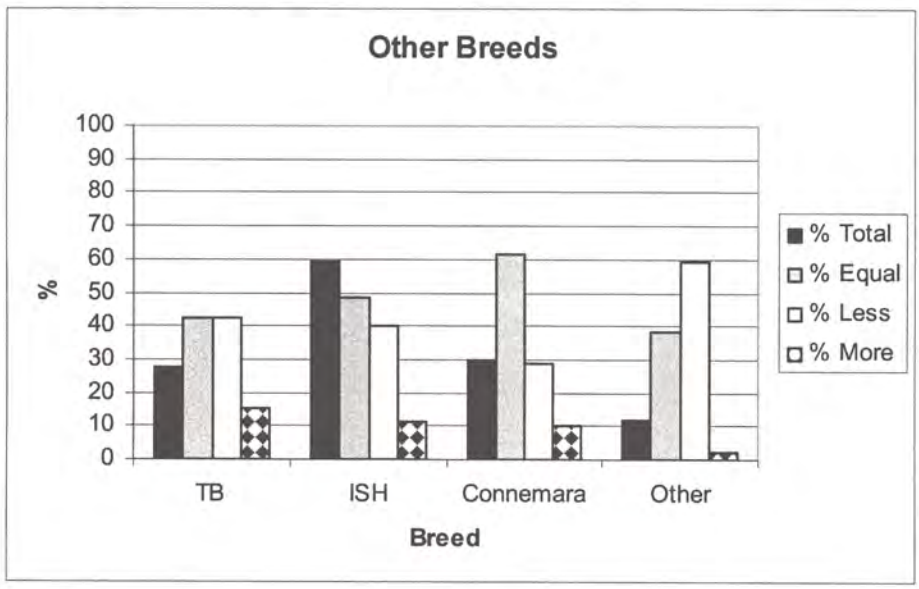
This figure clearly shows that almost all respondents would like to see the IDH conserved.

Q5: How do you rate the importance of the conservation of the IDH?

	Importance (%)			
	Very	**Quite**	**Not very**	**Not at all**
Financially	55	32	11	2
Culturally	82	16	2	-
Historically	85	13	2	-
Socially	59	33	6	2
As a foundation breed	95	4	1	-

This tables shows that IDH conservation is either very important or quite important for each of the categories. Ninety-five percent fell that it is very important for the IDH to be conserved as a foundation breed. It is clear also that financially and socially, involvement in IDH breeding is important.

Q6: What other breeds of horses do you keep and how important are those breeds to you compared to the IDH?



This figure shows the other breeds that the respondents keep and the importance of these breeds relative to the ID horses. The black bar represents the percent of the other breeds kept. About 60% of respondents who also had other breeds in addition to ID kept Irish Sport Horses, followed by the Connemara, the Thoroughbred and other breeds. The grey, white and check columns refer to the importance of the other breeds compared to the ID. For example, of those who also owned ISH, about 50% of the breeders said ISH were equally important, 40% said they were less important and about 11% said ISH were more important.

Q7: How do you rate the importance of the reasons you breed/own ID?

	Importance (%)			
	Very	**Quite**	**Not very**	**Not at all**
Stallions at stud	64	23	8	4
Selling	62	28	9	1
Showing	51	31	15	3
Foundation	86	12	2	-
Competition	45	36	16	3
Pleasure	67	28	4	1

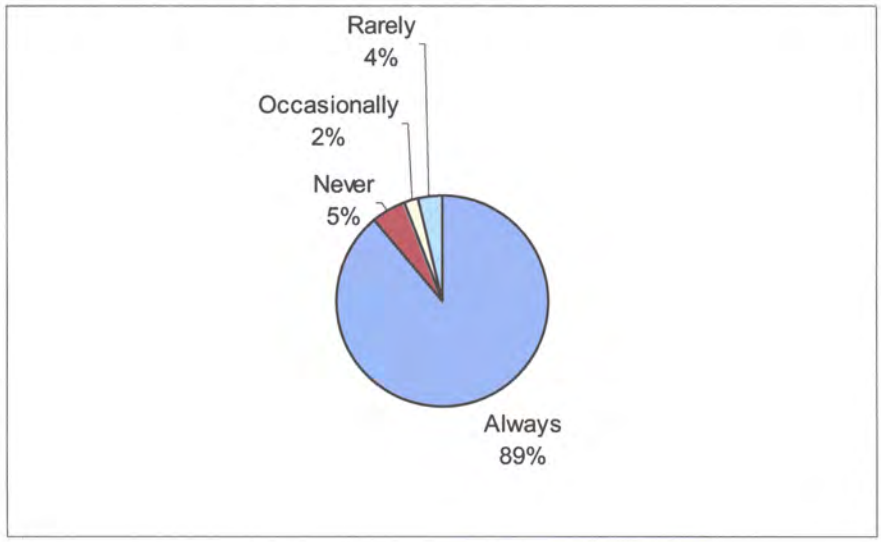
This table shows that there is a variety of reasons why people own and breed IDH. Competition and showing had 80% very or quite important, the other reasons had over 90% very or quite important. These figures tend to suggest that a number of markets exist for the future development of the breed.

Q8: How do you rate the importance of the characteristics when selecting a stallion?

	Importance (%)			
	Very	**Quite**	**Not very**	**Not at all**
Temperament	80	17	3	-
Conformation	92	8	-	-
Body	75	24	1	-
Movement/Action	87	13	-	-
Performance	54	36	8	2
Type	64	31	5	-
Bone	73	23	4	-
Pedigree	75	20	5	-
Head/Neck	75	23	2	-

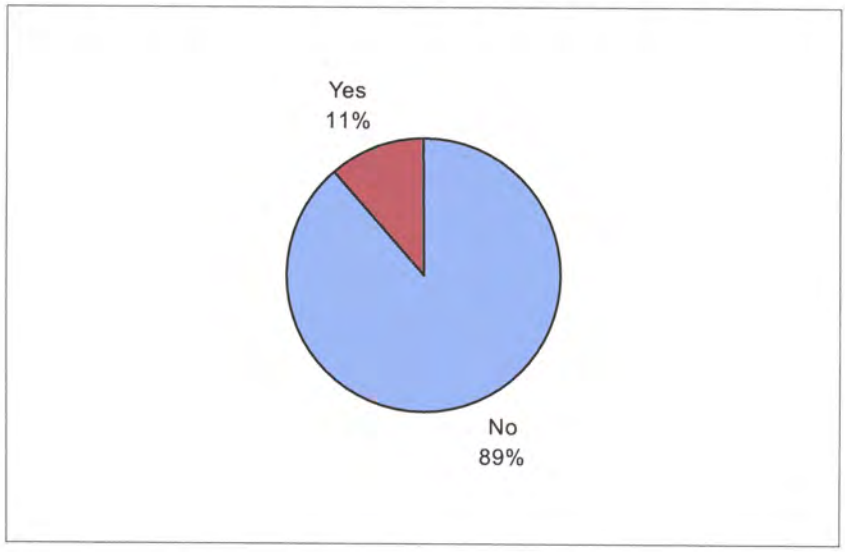
This table give us an indication of the characteristics breeders look for when selecting a stallion. Greater than 80% of respondents thought that temperament, conformation and movement/action were very important, with 100% saying the conformation and movement were either very or quite important. In general all the characteristics had a high response of very or quite important. Performance at 54% had the lowest 'very' response and was the only characteristic to have a 'not at all' response (2%). When asked if there were any other characteristics, the most often cited was colour and quality.

Q9: Do you take steps to avoid inbreeding?

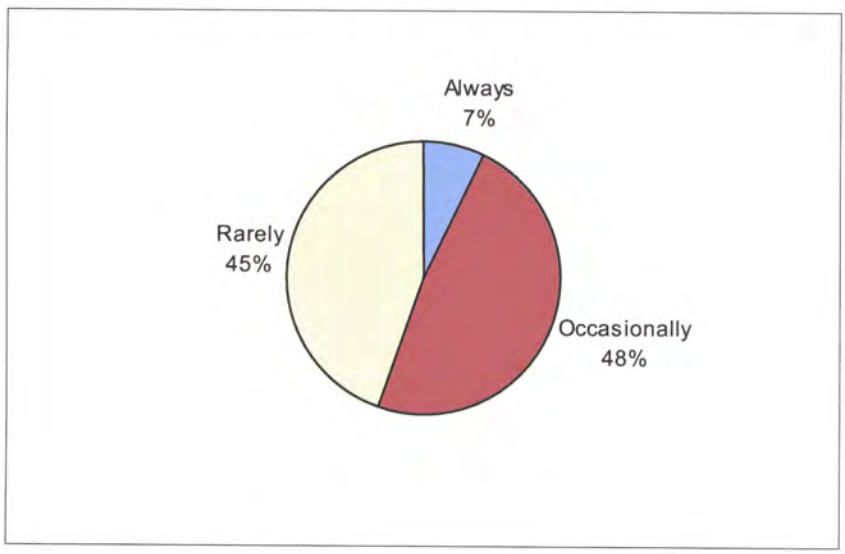


This figure shows that 89% of breeders always try to avoid inbreeding, while only 5% of breeders never try to avoid inbreeding.

Q10: Do you intentionally mate related animals (line breed)?



Q11: If yes, how frequently do you line breed?

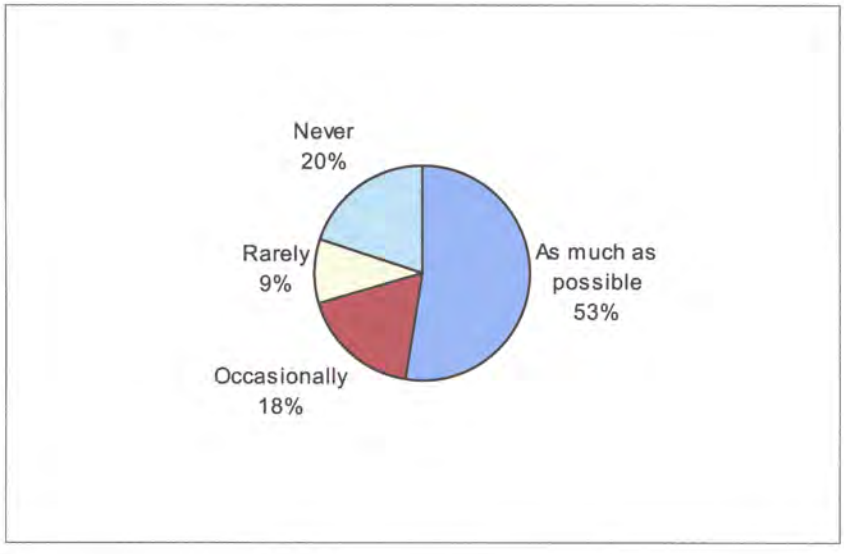


These figures show that about 11% of breeders intentionally mate related animals. Of those that practice line breeding, 7% always line breed while 45% rarely practice line breeding.

Q12: Describe the reasons you line breed.

Breeders were asked why they line bred. In general there were two main responses. About 36% of breeders said they line breed because they found it very difficult to avoid due to the lack of stallions available as an outcross. About 60% of those that line breed say they line breed to retain certain characteristics and lines/pedigrees. Of the other responses, one breeder said he was advised to line breed and others said it was for convenience.

Q13: Do you use out-cross stallions?



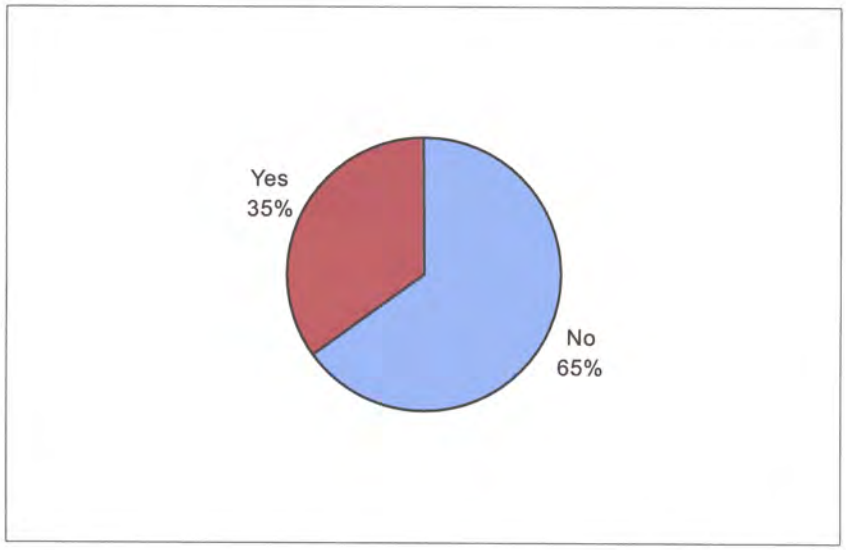
Fifty-three percent of breeders use out-cross stallions as much as possible while 20% of breeders never use out-cross stallions

Q14: What do you feel are the primary benefits and limitations of using out-cross stallions?

Most respondents felt that the primary benefits of using out-cross stallions were to avoid the consequences of inbreeding and to increase the genetic diversity of the breed.

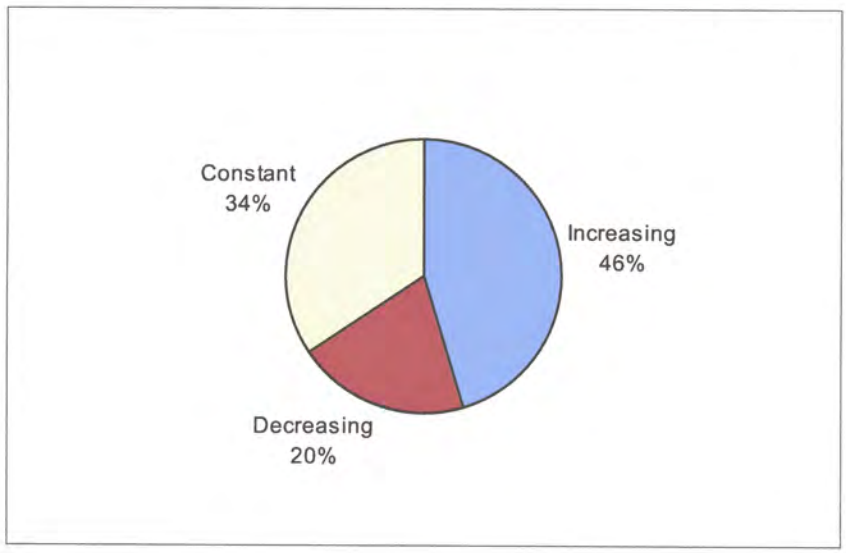
Regarding the limitations, most respondents felt that there was a lack of choice when it comes to out-cross stallions and that almost everything traces back to a couple of lines. Also breeders feel that there is a lack of quality and a lack in pedigree of some of the out-cross stallions available. Another primary limitation is the distance that breeders may have to travel to get an out-cross stallion, something that most are not prepared to do.

Q15: Do you use chilled semen?



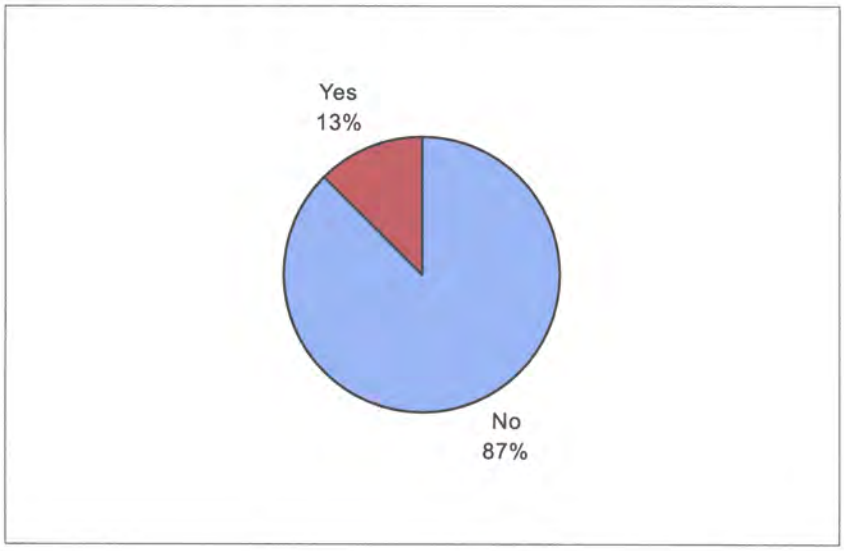
Nearly two-thirds of the respondents do not use chilled semen to breed their mares.

Q16: If yes, is your use increasing, decreasing or staying constant?



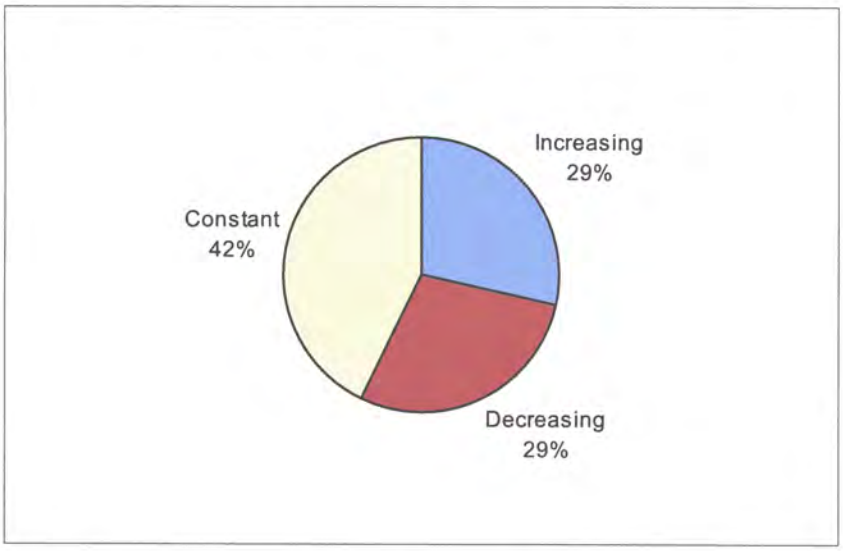
Eighty percent of respondents said that their chilled semen usage was either increasing or staying constant, with 20% saying it was decreasing.

Q17: Do you use frozen semen?



Eighty-seven percent of the respondents do not use frozen semen to breed their mares.

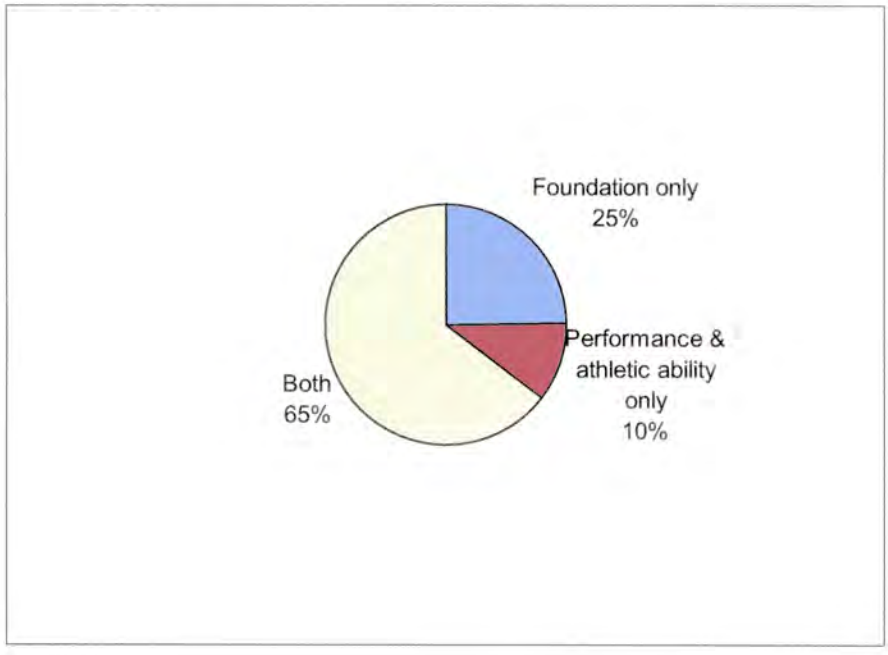
Q18: If yes, is your use increasing, decreasing or staying constant?



Seventy percent of respondents said that their frozen semen usage was either increasing or staying constant, with 29% saying it was decreasing.

In general, the last couple of questions address the current use of A.I among IDH breeders. The use of A.I. when breeding mares could play an important role in the future preservation of the IDH. If the success rate of A.I. could be increased it may provide breeders with easier access to out-cross stallions without the need to travel long distances.

Q19: In terms of the future development of the breed what type of animal would you like to breed?



Ten percent of respondents said they would like to see the IDH develop at the performance and athletic ability level only, followed by 25% would like to see it developed as a foundation only breed. However, nearly two thirds of respondents said they would like to see it develop at both levels.

Q20: Briefly describe how you would like to see the future of the breed develop?

This question allowed breeders to voice their opinion on how they would like to see the future of the breed develop. In general there were many aspects raised that breeders would like to see.

By far the most mentioned aspects of the future development of the breed were the need to incentivise the breeding of the IDH and better promotion of the IDH.

About twice as many breeders that mentioned performance felt that there was too much emphasis put on performance in the stallion approval process. Also feeding into this issue was the number of times that a lack of outcross stallions was mentioned. In general breeders felt that there was little choice when trying to avoid inbreeding.

Several breeders expressed concern that too many of the best ID animals were leaving the country and others expressed a desire to use RID stallions approved in other countries.

As regards the general characteristics of the breed, the loss of bone in the current draught was cited most often. Most breeders said they would like to see the draught retain its temperament and type.

Some breeders expressed a desire to see more classes at shows.

5 Discussion

The objectives of this phase of the project were to assess the level of relatedness within the IDH population. We have previously seen that inbreeding is increasing and more importantly the rate of inbreeding is increasing. There has also been a decline in the number of IDH mares in the population (Olori, 2004). In any population, inbreeding is driven by the relationships among the animals in the population. If the relationships among animals are increasing then more inbreeding is inevitable. Inbreeding can often lead to a decrease in the fitness of a population, and should be avoided or at the very least minimised. Stallions play the biggest role in the evolution of relationships in a population as they have the oppourtunity to breed many more offspring than females. However, the pedigrees of the mares are also very important as they pass on an equal amount of genes to an offspring as the stallion does. In order to increase the genetic diversity of a population it is necessary to identify animals that are less related to each other. As we have seen, the relationship of the ID populations to only 3 stallions is worryingly high. Should the current trend prevail it is likely that all mares and stallions will be traced to one lineage in the next couple of generation.

This study has shown that there are ID stallions available in other countries that could be used to increase the genetic diversity of the population. For example, 4 of the 5 least related stallions to the current mare population are standing in Great Britain. Also there are S1 stallions that could be potentially used to increase the genetic diversity of the breed. Several breeders expressed an interest in seeing more out-cross sires being made available to help increase the gene pool. The number of breeders who have used A. I. is encouraging as use of A. I this could help eliminate some of the logistical limitations of using out-cross stallions either standing in Ireland or abroad.

The potential to use stallions that are not RID and registered in Ireland has been hampered to some extent by the rules of entry into the studbook. For example progeny of S1 stallions and RID mares were, until recently, ineligible for entry into the ID studbook and were registered as Irish Sport Horses instead. Stallions standing in other countries are treated as S1 stallions for registration purposes also. Recently changes have been made whereby progeny of S1 stallions (hence including ID stallions in other countries) were given ID registrations. This should encourage breeders who wish to use rarer bloodlines to use these stallions in the future.

Another aspect to increasing the genetic diversity is to make more outcross stallions available. To this end the number of stallions achieving RID status should look to be increased. On average about 5 stallions per year achieve RID status. From appendix B it's clear that over the last number of years a lot of stallions show strong relationships to Clover Hill, King of Diamonds or Pride of Shaunlara. Interestingly, only one unrelated stallion, Come T has been passed since the introduction of performance testing. If performance testing is hindering the approval of stallions as RID then from a genetic conservation perspective, this should be reviewed to allow more diversity into the population.

The most time consuming part of this study was combining all pedigree files together to conduct the analysis. To do this it was vital to create as many links as possible

between the various studbooks. This however proved to be a difficult task due to the inconsistent nature of recording across the studbooks. There is a clear need to harmonise the recording of ID horses across different studbooks to ensure similar exercises can be conducted quickly in the future. At a minimum every individual should have a unique entry with corresponding sire and dam identifiers. These identifiers should be unique integer or alphanumeric and not just the sire and dam names. Ideally, the same identifier should be used to record animal pedigrees across each country. For example, an ID horse in GB, sired by a stallion standing in Ireland should be recorded using the same identifier for that stallion in Ireland and so on. There would be numerous advantages from a genetic conservation perspective to setting up a Worldwide Irish Draught horse studbook. Measures of population diversity and the relationship of stallions to the breeding population could easily be monitored. Such a system would ensure that accurate mating advice would be available to all ID horse breeders throughout the world. If this is not possible then each studbook should look at ways to harmonise the recording of ID pedigrees across countries.

The response to the survey and the conservation of the ID horse was extremely positive with a unanimous agreement among breeders that the breed should be conserved and more importantly developed and promoted to maximise its potential. It is obvious that they are many markets for the ID horse, and coupled with the enthusiasm of the breeders, there is great potential for the future development of the breed.

The next phase of the conservation plan is to evaluate the various options for the conservation of the IDH along with the stakeholders. From this it is hoped that key recommendations can be made that will allow the IDH breed to be conserved and most importantly, to prosper.

6 Acknowledgements

The author would like to thank all those people that provided data and information, and helped carry out and input results of the survey. Also, a word of thanks to the breeders for responding to the survey and to all others who contributed in some way to this study.

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8 Appendices

8.1 Appendix A- Questionnaire

The purpose of this questionnaire is to gather information on breeding practices and potential future directions for the breed. Please feel free to expand on any of the questions and provide additional details you think may help in the development of a conservation plan for the Irish Draught Horse.

Name:
Address:
Stud ID and Stud Name (if any):
Tel. No. and Email:

1) How many years have you been involved in Irish Draught Horse breeding?_____

2) Do you intend to remain an Irish Draught Breeder in the foreseeable future? Yes No

3) If yes, do you intend to Expand Contract Stay Constant

4) Would you like to see the Irish Draught Horse conserved? Yes No Don't Know

5) How do you rate the importance of the conservation of the Irish Draught Horse? Please Circle

Financially	Very	Quite	Not very	Not at all
Culturally	Very	Quite	Not very	Not at all
Historically	Very	Quite	Not very	Not at all
Socially	Very	Quite	Not very	Not at all
As Foundation breed	Very	Quite	Not very	Not at all

6) What other breeds of horses do you keep (if any) and circle how important the breeds are to you compared to the Irish Draught Horse

Thoroughbreed	More Important	Less important	Equally Important
Irish Sport Horses	More Important	Less important	Equally Important
Connemara Ponies	More Important	Less important	Equally Important

Other (Please specify and indicate importance)

7) How do you rate the importance of the reasons why you breed/own Irish Draught Horses.

Stallion(s) at stud	Very	Quite	Not very	Not at all
Selling Irish Draught horses	Very	Quite	Not very	Not at all
Showing	Very	Quite	Not very	Not at all
Foundation Horse	Very	Quite	Not very	Not at all
Competition	Very	Quite	Not very	Not at all
Pleasure	Very	Quite	Not very	Not at all
Other (please specify + rate)	Very	Quite	Not very	Not at all

8) How do you rate the importance of the characteristics you look for when selecting a stallion:

Temperament	Very	Quite	Not very	Not at all
Conformation	Very	Quite	Not very	Not at all
Body	Very	Quite	Not very	Not at all
Movement/Action	Very	Quite	Not very	Not at all
Performance	Very	Quite	Not very	Not at all
Type	Very	Quite	Not very	Not at all
Bone	Very	Quite	Not very	Not at all
Pedigree	Very	Quite	Not very	Not at all
Head/Neck	Very	Quite	Not very	Not at all
Other (please specify + rate)	Very	Quite	Not very	Not at all

9) Do you take steps to avoid the mating of related animals (inbreeding)? Please Circle

Always Occasionally Rarely Never

10) Do you intentionally mate related animals (linebreeding)? Please Circle Yes No

11) If Yes, how frequently do you practice linebreeding? Please Circle

Always Occasionally Rarely

12) Briefly describe the primary reasons you linebreed

13) Do you use out-cross sires? Please Circle

As much as possible Occasionally Rarely Never

14) What do you feel are the primary benefits and limitations of using out-cross sires?

15) Do you use chilled semen?	Yes	No	
16) If yes, is your use of chilled semen	Increasing	Decreasing	Constant
17) Do you use frozen semen?	Yes	No	
18) If yes, is your use of frozen semen	Increasing	Decreasing	Constant

19) In terms of the future development of the breed what type of animal would you like to breed? Please tick

Foundation Stock only	☐
Performance & athletic ability only	☐
Both	☐
Other (please specify)	

20) Briefly describe how you would like to see the future of the breed develop

21) Additional Comments

8.2 Appendix B – Active Stallions

Name, date of birth (DoB), year of approval (YoA), country of standing (CoS), pedigree completeness index (PCI), co-efficient of inbreeding (Inbr), mean relationship to the mare population (Rel %) and relationship to King of Diamonds (Rel-KoD), Pride of Shaunlara (Rel- PoS) and Clover Hill (Rel- CH)

Name	DoB	YoA	CoS	PCI	Inbr %	Rel %	Rel - KoD%	Rel - PoS%	Rel - CH%
2004									
Bridgeford Stockbroker	1989	2004	IRE	0.83	0.00	0.48	0.00	0.00	0
Diamond Design	2001	2004	IRE	0.96	0.00	3.07	14.16	1.86	1E-05
Gurraun Zidane	1999	2004	IRE	0.96	0.00	3.38	0.30	3.23	0
Kensons King William	1989	2004	IRE	0.87	0.78	1.11	0.20	3.13	0
Sir Stormy Breeze	1992	2004	IRE	0.69	0.02	2.06	25.05	0.44	0
Westfield Bobby	1996	2004	IRE	0.65	0.00	3.37	14.07	0.30	50
2003									
Clonleigh Dancer	1999	2003	IRE	1.00	0.04	3.26	14.32	12.86	0
Gentle Diamond	1998	2003	IRE	1.00	0.15	3.02	13.03	3.65	0
Huntingfield Heathcliff	1993	2003	IRE	0.91	0.00	1.45	0.11	6.27	0
Pride Of Meath	1987	2003	IRE	0.83	0.00	3.36	0.78	50.00	0
Skippy Diamond Clover	1998	2003	IRE	0.92	0.05	2.88	12.70	3.32	25
2002									
Drumhowan Gold	1998	2002	IRE	0.91	0.29	3.68	28.52	0.98	0
Kensons Aragorn	1988	2002	GB	0.77	0.00	0.43	0.01	0.01	0
Penmerryls Rhythm And Blues	1998	2002	IRE	1.00	3.71	1.53	0.35	5.47	0
2001									
Come T	1996	2001	IRE	0.92	0.00	1.47	0.00	0.00	0
Kec Bluejay Diamond	1997	2001	IRE	0.92	3.55	4.29	32.23	0.74	0
Mackney Clover	1996	2001	IRE	0.67	0.00	3.87	12.60	0.30	50
Sir Rivie	1993	2001	IRE	0.92	0.08	2.31	7.45	2.12	0
2000									
All The Diamonds	1995	2000	IRE	0.96	0.14	4.10	25.25	0.64	0
Amber Legend	1989	2000	IRE	0.87	2.34	1.76	0.20	12.51	0
Clonakilty Hero	1996	2000	IRE	0.83	3.91	1.12	0.04	0.04	0
Coolcronan Wood	1996	2000	IRE	0.96	0.10	1.48	0.46	0.46	0
Donovan	1991	2000	IRE	0.79	0.00	2.10	0.39	0.39	0
Kec Double Diamond	1996	2000	IRE	0.96	6.30	4.52	31.50	0.74	0
Supreme Ginger	1995	2000	IRE	0.71	0.00	3.32	14.06	3.42	0
1999									
Attwood Black Laughton	1985	1999	GB	0.83	0.01	1.58	0.22	0.22	0
Foxglen Himself	1991	1999	IRE	0.86	0.15	1.74	14.45	25.29	0
Hangon Johnny	1988	1999	IRE	0.83	0.01	2.28	0.46	0.46	0
Star Kingdom	1994	1999	IRE	0.91	0.12	3.85	25.25	12.95	0
Welcome Flagmount	1996	1999	IRE	0.87	0.29	3.87	28.52	6.84	0
1998									
Crosstown Pride	1995	1998	IRE	1.00	2.51	3.55	14.45	15.92	0
Drumri	1991	1998	IRE	0.91	0.15	3.93	28.32	3.71	0
Finns Clover Inn	1995	1998	IRE	0.67	0.00	3.90	12.60	0.30	50
Glenlara	1987	1998	IRE	0.83	0.20	3.31	0.79	25.40	0
Grange Bouncer	1992	1998	IRE	0.87	0.02	2.21	0.42	25.03	0
Mount Diamond Flag	1994	1998	IRE	0.87	0.15	3.97	28.32	3.71	0
1997									
Coopers Hill	1990	1997	IRE	0.60	0.00	2.50	0.00	0.00	50
Herrero	1993	1997	USA	1.00	0.88	3.91	0.60	15.84	0

O Learys Irish Diamond	1994	1997	IRE	0.92	3.55	4.29	32.23	0.74	0
Parkmore Pride	1991	1997	IRE	0.83	0.02	3.49	0.81	50.02	0
Rockrimmon Silver Diamond	1994	1997	IRE	0.96	0.01	2.17	12.62	6.47	0
The Pride Of Gloster	1993	1997	IRE	0.67	0.00	3.49	0.40	25.01	50
1996									
Coille Mor Hill	1987	1996	IRE	0.50	0.00	1.91	0.00	0.00	50
Huntingfield Rebel	1990	1996	IRE	0.87	0.00	2.06	0.00	0.00	0
1995									
Castana	1991	1995	IRE	0.96	0.10	3.26	12.70	0.40	1E-05
Celtic Gold	1992	1995	IRE	0.96	0.42	3.05	0.30	0.30	25
1994									
Ben Calverstown	1984	1994	IRE	0.58	0.00	2.72	0.78	0.78	0
Fast Silver	1991	1994	IRE	0.83	0.00	2.38	0.39	25.00	0
Its The Quiet Man	1991	1994	IRE	0.87	0.01	1.97	6.29	0.14	0
Westmeath Lad	1991	1994	IRE	0.91	0.12	4.21	25.25	0.64	0
1993									
Classic Vision	1990	1993	IRE	0.71	0.00	3.30	14.06	0.29	0
Crosstown Dancer	1990	1993	IRE	0.91	0.29	5.18	28.52	25.59	0
Diamond Clover	1990	1993	IRE	0.65	0.00	3.82	25.00	0.39	50
Ginger Holly	1989	1993	IRE	0.71	0.00	3.47	14.07	0.30	0
Grosvenor Lad	1990	1993	IRE	0.83	0.30	3.20	6.85	3.92	0
Mountain Pearl	1989	1993	IRE	0.58	0.00	1.87	0.01	0.01	0
The Bard	1989	1993	IRE	0.71	0.21	3.49	0.99	13.29	0
Welcome Diamond	1990	1993	IRE	0.92	0.30	5.03	25.59	6.84	0
Woodland Boy	1990	1993	IRE	0.87	0.07	1.75	0.34	1.81	0
Wyzer Diamond	1990	1993	IRE	0.87	0.02	3.39	25.23	0.62	0
1992									
Agherlow	1988	1992	IRE	0.87	0.31	2.80	0.60	12.90	0
Ard Grandpa	1989	1992	IRE	0.67	0.00	1.12	0.21	3.14	0
Corran Ginger	1989	1992	IRE	0.71	0.00	3.05	12.50	0.20	0
Creggan Emperor	1989	1992	IRE	0.83	0.00	2.96	0.59	3.52	0
Dunkerrin Grey Mist	1989	1992	IRE	0.65	0.00	2.58	0.00	25.00	0
Merry Mate	1988	1992	IRE	0.68	0.00	2.60	0.01	0.01	0
Ri An Domhan	1988	1992	USA	0.96	0.02	2.80	14.00	0.03	0
Sammys Pride	1988	1992	IRE	0.54	0.00	1.22	0.01	0.01	0
1991									
Gold Link	1988	1991	IRE	0.69	0.00	1.21	0.20	0.20	0
Golden Trump	1988	1991	IRE	0.92	0.56	4.58	26.19	3.78	25
Mourne Mountain Star	1988	1991	IRE	0.92	0.40	2.84	0.23	12.53	0
Springpark Jack The Lad	1988	1991	IRE	0.63	0.00	1.69	0.39	25.00	0
Sumas Murphys Law	1988	1991	GB	0.87	0.00	3.75	0.78	50.00	0
1990									
Annaghdown Star	1987	1990	IRE	0.87	0.00	3.24	0.40	25.01	0
Blue Champion	1986	1990	GB	0.87	0.00	2.02	0.21	12.52	0
Crannagh Hero	1986	1990	IRE	0.71	0.00	2.17	0.22	12.52	0
Red Hackle	1987	1990	IRE	0.54	0.00	1.45	0.01	0.01	0
1989									
Elm Hill	1986	1989	IRE	0.83	0.00	0.99	0.05	0.05	0

1988									
Coolehane Flight	1985	1988	IRE	0.54	0.00	0.82	0.00	0.00	0
Cream Of Diamonds	1985	1988	IRE	0.87	0.10	3.61	25.20	3.52	0
Home Rule	1983	1988	IRE	0.87	0.00	2.64	14.07	0.31	0
King Henry	1983	1988	IRE	0.54	0.00	3.70	50.00	0.78	0
Naldo	1985	1988	IRE	0.65	0.00	2.18	0.01	0.01	0
1987									
Rne Shore	1983	1987	IRE	0.69	0.22	3.54	25.44	6.69	0
Silver Glider	1984	1987	IRE	0.92	1.71	3.86	14.45	0.68	0
1986									
Blue Rajah	1983	1986	IRE	0.71	0.00	1.59	0.01	0.01	0
Brown Lad Lara	1979	1986	IRE	0.58	3.13	1.33	0.05	0.05	0
Diamond Rock	1979	1986	IRE	0.58	0.39	3.84	50.39	1.17	0
Duleek Hero	1983	1986	IRE	0.83	0.24	4.44	25.45	0.84	0
Holycross	1983	1986	IRE	0.58	0.39	4.07	1.17	7.03	0
Silver Granite	1983	1986	IRE	0.79	0.00	1.81	0.42	6.27	0
1985									
Carrabawn View	1982	1985	IRE	0.69	0.00	2.49	0.01	0.01	0
Glidawn Diamond	1982	1985	IRE	0.69	0.40	6.35	50.40	1.18	0
Golden Warrior	1981	1985	IRE	0.83	0.00	1.56	0.03	0.03	0
Rakish Paddy*	1982	1985	IRE	0.69	0.03	2.49	0.79	12.51	1E-05
1984									
Copper King*	1978	1984	IRE	0.58	0.00	3.75	50.00	0.78	0
Flagmount King	1981	1984	IRE	0.58	6.25	5.19	56.25	1.17	0
Jack Of Diamonds	1981	1984	IRE	0.54	0.00	4.43	50.00	0.78	0
1983									
Corrandulla Star	1980	1983	IRE	0.79	0.00	2.16	0.39	6.25	0
Powerswood Purple	1980	1983	IRE	0.58	0.10	3.75	0.88	0.88	0
Sillot Hill*	1980	1983	IRE	0.63	0.00	1.25	0.05	0.05	0
1982									
Seacrest	1979	1982	IRE	0.66	0.05	1.26	0.83	0.83	0
The Conqueror	1979	1982	IRE	0.69	0.00	4.06	28.13	0.59	0
1981									
Kildalton King	1978	1981	IRE	0.69	0.40	6.18	50.40	1.18	0
IHR Approved But Year Of Approval Unknown									
Ballinrobe Boy	1977	?	IRE	0.58	0.00	2.25	0.39	0.39	0
Gortlea Ruler	1986	?	IRE	0.54	0.00	0.91	0.00	0.00	0
Townrath Pride	1984	?	IRE	0.91	0.00	3.86	0.78	50.00	0
Stallions registered in England and the US									
Alices Diamond Slipper	1990		GB	1.00	0.04	3.04	12.71	1.87	0
Amber Glen	1987		GB	0.87	3.13	1.83	0.00	0.00	0
Avanti Amorous Archie	2001		GB	1.00	0.64	3.42	14.41	15.14	0
Ballyknowe Prince	1985		GB	0.75	0.00	0.60	0.39	0.39	0
Baltydaniel Breeze	1998		GB	0.71	0.01	1.28	7.09	0.20	0
Banks Fee Daniel	1987		USA	0.69	0.00	1.49	0.39	6.25	0
Barracaberry Orbit	1992		GB	0.96	0.02	2.28	0.25	12.55	0

Bealagh Blue	1992	GB	1.00	0.05	1.70	0.40	3.33	1E-05
Beeston Lord Henry	1993	GB	0.83	0.01	1.77	0.41	25.02	0
Blackthorn	1991	GB	0.92	0.02	2.18	12.58	0.27	0
Bowland Bradley	2001	GB	1.00	0.05	1.38	3.30	6.37	0
Braveheart	2000	USA	1.00	2.90	3.71	23.25	6.77	0
Bridon Beale Street	2000	USA	0.91	0.44	2.51	0.21	12.51	0
Caerba Legacy	2000	GB	1.00	2.37	2.27	0.49	26.57	1E-05
Carrick Gold	1992	GB	0.91	1.57	2.51	0.23	0.23	0
Connaught Grey	1990	GB	0.91	0.12	3.41	0.64	8.26	0
Coosheen Ballymurphy	1992	GB	0.71	0.02	1.70	0.51	1.98	0
Cork Arthur	1988	GB	0.69	0.00	0.80	0.05	0.05	0
Corrcullen	1996	USA	1.00	0.81	2.81	0.40	8.02	1E-05
Cradilo	1993	USA	1.00	0.10	3.11	0.60	6.46	0
Dandelion Diamond Rebel	2001	USA	1.00	1.34	3.33	13.61	8.92	0
Ebony Hill	1992	GB	0.86	0.00	1.11	0.20	3.13	0
Enniskeane Prince	1979	GB	0.69	0.02	4.04	0.81	50.02	0
Finbarr	1976	GB	0.63	0.00	3.49	0.78	50.00	0
Fintan Himself	1994	GB	0.87	0.00	1.65	0.11	0.11	0
Flag Of Diamonds	2000	USA	0.91	0.08	3.72	28.23	6.85	0
Fnf Gillians Clover	1999	USA	0.96	0.16	3.28	12.74	12.74	25
Foxglen Finn	1992	GB	0.87	0.15	3.14	14.45	25.29	0
Garryowen Of Suma	1984	USA	0.83	0.39	3.22	1.17	50.39	0
Glen Brae	1984	GB	0.87	1.56	2.48	14.06	0.29	0
Grange Augustus	1988	USA	0.83	0.00	2.22	0.41	25.02	0
Grove Warrior	1986	GB	0.42	0.00	0.36	0.00	0.00	0
Happy Ending	1988	USA	0.92	0.00	1.23	0.22	3.14	0
Harkaway Lionhawk	2001	USA	0.96	2.15	1.93	0.45	9.38	0
Hawklands Silver Prince	1992	GB	0.83	0.00	1.43	6.26	0.40	0
Hello Paddy	1996	USA	0.96	3.18	2.99	0.89	31.36	0
Hillviewfarm Milligan	1994	GB	0.96	0.79	2.82	0.50	12.51	0
Hillviewfarm Superstar	2002	GB	0.91	0.10	2.01	6.45	12.90	0
Huntingfield Proud Tim	1993	USA	0.91	0.00	1.68	0.40	25.01	0
Its The Luck Of The Irish	1996	USA	0.91	0.07	3.33	28.22	0.68	0
Kensons High Prospect	1993	GB	0.74	0.00	3.08	0.42	25.03	0
Kensons Mosaic	1992	GB	0.83	0.39	0.91	0.01	0.01	0
Kerryoak Captain	1991	GB	1.00	2.19	2.98	0.53	18.98	0
Kilpeck Diamond Knight	1997	USA	0.87	0.93	2.56	12.79	8.40	0
Kilpeck Saint George	2000	USA	0.96	0.00	1.40	0.21	12.52	0
Knockboy Hero	1984	GB	0.58	0.78	2.61	13.28	13.28	0
Ladys Tralee Raj	1991	GB	1.00	1.62	1.81	0.81	9.60	0
Macha Breeze	1998	USA	0.92	0.10	2.56	0.23	12.53	0
Moorpark Image	1999	USA	0.87	0.00	2.12	14.07	0.31	0
On A High	1992	GB	1.00	0.06	2.07	0.43	3.36	1E-05
O' Sullivan	1982	GB	0.71	0.00	3.53	0.40	25.01	0
Phf Shanahoe	1995	USA	0.96	0.39	2.64	12.51	0.20	0
Prescotts Diamond	1999	USA	0.91	0.26	4.04	28.47	5.47	0
Rebelara	1993	GB	0.91	0.00	2.96	0.49	26.57	1E-05
Rhyds Seaquest	1994	USA	0.92	0.08	2.30	7.45	2.12	0
Riverbank	1981	GB	0.87	0.21	3.78	25.42	0.81	0

Roeview Pride	1989	GB	0.92	0.21	2.62	0.81	6.67	0
Roma Atlantic Moonshine	1987	GB	0.83	0.00	0.97	0.05	0.05	0
Roma Caen Hill Flight	1990	GB	0.83	0.00	0.93	0.03	0.03	0
Roma Diamond Skip	1992	GB	0.80	0.88	3.30	13.09	16.02	0
Shaunas Diamond	1984	GB	0.92	3.52	5.14	25.79	25.79	0
Silver Jasper	1977	GB	0.58	0.00	1.05	0.01	0.01	0
Skip And Sea	2001	GB	1.00	0.27	1.66	3.58	3.43	1E-05
Skippy Too	1990	GB	0.83	0.00	1.75	0.39	6.25	0
Snowford Benson	1985	GB	0.69	0.39	3.07	1.17	7.03	1E-05
Snowford Mount Western	2001	GB	1.00	1.77	1.26	3.72	3.20	1E-05
Snowford O Donnell	1991	USA	0.87	1.56	1.52	0.59	9.38	0
Snowford Pinkston	1983	GB	0.83	0.02	1.34	0.42	6.28	0
The Irish Rover	1993	USA	0.96	0.11	3.64	0.62	25.23	0
The King Of Hearts	1994	USA	0.71	0.30	3.39	25.59	13.29	0
Tobias Corbett	1986	GB	0.58	0.01	1.73	12.51	0.79	0
Tors Gentleman Farmer	1998	USA	0.96	0.20	2.60	0.41	25.02	1E-05
Tors Murphy Mcginty	2001	USA	0.96	0.03	1.92	6.55	8.01	0
Touch Of Pride	1995	GB	0.96	3.67	3.61	26.98	6.76	0
Touch Of The Blues	1987	USA	0.87	0.00	1.82	0.40	6.26	0
Waltons Golden Fox	1997	GB	0.96	1.57	2.65	0.59	28.13	0
Western Sun	1988	USA	0.66	0.00	1.22	0.39	6.25	0
Winmaur Sargeant Pepper	1996	USA	0.92	6.64	1.53	0.40	6.26	0
Young Prospect	1990	GB	0.92	0.10	2.95	12.90	25.21	0

*indicates stallion either deceased or no longer breeding

8.3 Appendix C – S1 Stallions

Name, pedigree completeness index (PCI), co-efficient of inbreeding (Inbr%), mean relationship to the mare population (Rel %) and relationship to King of Diamonds (Rel-KoD), Pride of Shaunlara (Rel- PoS) and Clover Hill (Rel- CH)

Name	PCI	Inbr %	Mean Rel %	Rel - KOD	Rel - POS	Rel - CH
Las Vegas Diamond	0.957	0.37	5.71	25.69	25.69	0.0
Diamond Cracker	0.909	0.37	5.06	25.69	28.62	0.0
Belclare Cross	1.000	2.24	4.94	14.50	20.66	0.0
KEC Diamond Millinium	0.917	3.30	4.92	2.35	25.49	0.0
Glid Uibhall	0.957	3.29	4.86	0.74	31.50	0.0
Irish Mist Two	0.917	0.00	4.73	0.59	25.20	0.0
WRS Sun Rich	0.957	1.20	4.47	15.73	0.50	0.0
Connacht Diamond	0.917	0.00	4.46	0.59	25.20	0.0
Laurelview Dancer	1.000	1.75	4.46	19.05	14.36	0.0
KEC Diamond Dynasty	0.957	0.00	4.44	0.59	25.20	12.5
Flagmount Clover Diamond	0.873	1.33	4.32	3.77	29.11	25.0
Galway Star	0.917	0.15	4.26	13.09	25.40	0.0
Glenanareen Prince	0.873	0.22	4.19	2.35	28.42	0.0
Bellews Pride	0.957	0.09	4.14	26.71	7.52	0.0
Gurraun Alfie	1.000	1.18	4.09	17.59	3.82	0.0
Pospect Diamonds	0.873	0.20	4.06	25.39	25.39	0.0
Kilnagralta Failte Flagmount	0.873	0.29	4.06	6.84	28.52	0.0
Franks Fancy	1.000	0.08	3.99	12.80	14.26	0.0
Rapid Raimondo	1.000	0.47	3.85	14.37	14.37	0.0
Callanagh Gold	1.000	4.70	3.79	0.42	0.42	0.0
Willows Pride	0.873	0.02	3.77	50.02	0.81	0.0
Loughry Lad	0.833	0.01	3.74	50.01	0.79	0.0
Moyans Glenside Rebel	0.909	0.00	3.72	25.00	0.39	0.0
Belline Tynagh Gold	1.000	0.10	3.68	6.46	0.60	0.0
Gurraun Golden Eye	1.000	0.10	3.68	6.46	0.60	0.0
The Kings Son	0.957	0.93	3.59	13.20	13.20	0.0
Young Carrabawn	0.917	0.00	3.57	3.18	3.18	0.0
Mackney Hill	0.667	0.00	3.56	0.30	12.60	50.0
Gortfree Hero	1.000	0.70	3.54	3.38	6.60	0.0
Oh Carol's Rebel	1.000	3.13	3.45	25.10	0.49	0.0
Moyan Ginger Diamond	0.873	0.00	3.45	1.71	7.03	0.0
Deise King	0.957	0.04	3.41	12.77	3.91	0.0
Caherlea King	0.909	0.08	3.35	7.43	0.55	0.0
Dancing Boy	0.647	0.00	3.32	0.39	25.00	50.0
Clonleigh Rebel	0.957	0.04	3.30	3.28	6.50	0.0
Allys Bridge	0.873	0.00	3.27	12.61	0.11	25.0
Star Supreme	1.000	1.27	3.25	8.33	3.94	0.0
Ros Rebel	1.000	3.43	3.20	3.18	0.25	0.0
King Alfred	0.833	0.01	3.19	0.45	25.05	0.0
Purple Arch	0.833	0.00	3.19	0.44	0.44	0.0
Atlantic Watt	0.957	0.01	3.17	1.97	3.44	0.0
Cushleake Clover	0.647	0.00	3.15	0.15	7.03	50.0
Carrickrock Close Shave	0.800	1.56	3.10	18.90	7.33	0.0
Ardglen Boy	0.625	0.00	3.08	0.59	28.13	0.0
Kildaulton Copper	0.957	0.00	3.08	0.20	0.20	0.0

Diamond Mine	0.741	0.00	3.08	0.59	28.13	0.0
Togher Lad	1.000	0.50	3.01	3.55	12.93	0.0
Windgap Blue	0.957	0.10	3.00	6.37	6.37	0.0
Rosheen Yeats	1.000	0.59	2.99	0.93	7.08	0.0
Grandpas Diamond	0.957	0.05	2.93	1.91	12.75	0.0
Carlton Hill	0.647	0.00	2.91	12.51	0.21	50.0
Rockbarton Silver	1.000	1.57	2.91	18.77	0.31	0.0
Glenaraneen King	0.957	0.96	2.89	2.12	6.81	0.0
Paddys Prince	0.957	0.11	2.89	6.46	6.76	0.0
Dunkerrin Leader	0.873	0.00	2.85	12.50	0.00	25.0
Purple Lad	0.909	0.81	2.75	0.49	0.49	0.0
Purple Hero	0.909	0.81	2.75	0.49	0.49	0.0
Porthall Leo	0.873	0.10	2.67	12.89	0.59	0.0
Rockrimmon Robusticus	0.909	0.05	2.65	3.32	6.55	0.0
The Four Alls	0.957	0.05	2.63	12.70	0.40	0.0
Killea Hill View	0.873	0.00	2.63	6.25	0.40	0.0
Murphys Man	0.957	0.44	2.63	4.88	12.79	0.0
Welcome Dawn	0.957	0.18	2.55	3.71	14.55	0.0
Del Amitri	0.909	3.37	2.54	0.16	6.31	0.0
Pride of the Loch	0.909	1.58	2.54	14.29	0.52	0.0
Glosters Clover Dream	0.873	0.15	2.50	13.09	6.65	25.0
Oughboy	0.873	0.01	2.41	25.02	0.42	0.0
Rockhill Clover	0.625	0.00	2.37	6.25	0.39	50.0
Clover Skippy	0.647	0.00	2.36	3.13	0.20	50.0
Terenure Lad	1.000	1.23	2.35	12.71	3.63	0.0
Murnacbeg Clover	0.647	0.00	2.32	6.67	0.81	50.0
Cahermoyle Prince	0.957	0.01	2.21	6.47	12.62	0.0
Ballyhoura Breeze	0.737	0.03	2.20	25.08	0.47	0.0
Clonleigh Silver Mist	1.000	1.61	2.16	0.50	3.43	0.0
Clover Dubh	0.625	0.00	2.10	6.25	0.39	50.0
Coolcaum Hill	0.647	0.00	2.09	0.10	0.10	50.0
Cloneen Clover	0.625	0.00	1.92	0.00	0.00	50.0
Tullycommon Boy	0.713	0.44	1.90	12.94	1.22	0.0
Gortlea Clover	0.873	0.00	1.81	3.14	0.21	28.1
Manor Pearl	0.909	0.39	1.72	1.57	0.11	0.0
Clover Park	0.538	0.00	1.55	0.78	0.78	50.0
Luke Skywalker	0.917	0.40	1.35	1.62	0.15	0.0
Grey Laughton	0.600	0.00	1.21	0.10	0.10	0.0
Allen Rock	0.737	0.05	1.17	3.33	0.40	0.0
Arthurs Gold	0.873	0.00	0.71	0.02	0.02	0.0
Young George	0.909	0.02	0.65	0.05	0.05	0.0