



Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Veterinary Medicine and Animal Science
Department of Animal Breeding and Genetics

Global Horse Population with respect to Breeds and Risk Status

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Department of Animal Breeding and Genetics
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– European Master in Animal
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Education and Culture

Erasmus Mundus

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Abbreviations

AHC	American Horse Council
AnGR	Animal Genetic Resources
BC	Before Christ
CAU	Christian Albrechts University
CB	Cold Blood horses
CR	Countries Reporting
DAD-IS	Domestic Animal Diversity Information System
EAAP	European Association for Animal Production
EM-ABG	European Master in Animal Breeding and Genetics
EU	European Union
FAO	Food and Agriculture Organisation
FEI	Fédération Equestre Internationale
ITB	International Transboundary Breeds
IUCN	International Union for the Conservation of Nature and Natural Resources
LAC	Latin America and Caribbean
NZ	New Zealand
OSU	Oklahoma State University
SA	South Africa
SLU	Swedish University of Agricultural Sciences
UK	United Kingdom
UN	United Nations
UNPD	United Nations Population Division
USA	United States of America
WB	Warm Blood horses

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Summary

This study was performed based on FAOSTAT and DAD-IS database systems of Food and Agriculture of United Nations in order to describe the number of horses, horses per 1000 persons, number of horse breeds and the risk status of horse breeds in the world. In 2008, there are 58.7 million horses in the world, South America dominating (15 millions) followed by Asia (13.8 millions), North America (9.8 millions), Latin America and Caribbean (8.7 millions), Europe (6.3 millions), Africa (4.5 millions) and Oceania (0.41 million). Interestingly from the results of 2000 to 2008 data the population of horses is continuously decreasing in Europe, Asia and South America whilst gradually increasing in North America, Latin America and Caribbean, Africa and Oceania. The figure of horses per 1000 persons in the world was 8.7 for 2008. In the same year, Latin America and Caribbean, South America, North America, Oceania, Europe, Africa and Asia had 45.7, 38.9, 28.7, 11.8, 8.7, 4.6 and 3.4 horses per 1000 persons respectively. A total of 784 horse breeds have been reported in the world of which 655 are local, 62 are regional transboundary and 67 are international transboundary breeds. Europe makes up more than half of all horse breeds in the world while Latin America and Caribbean reported the least number of horse breeds. The majority of the reported horse breeds are unknown breeds. The Arab and Thoroughbred horses are the most diversified horse breeds in the world. A total of 22.6 % of the world's horse breeds are "at risk" while 11.5 % are extinct from the world. It was shown that 31.8 % of the horse breeds were not at risk while 34.1 % had an unknown status. This study reflects that Europe provides relatively good information of the horses to FAO as compared to other continents. It would be very informative to do further studies to determine the overall impression of the horses in the world.

1. Introduction

Horses are present throughout the world. Horses have been with humans throughout history and have served a variety of practical purposes. These include serving as a means of transport, a work animal in agriculture and in war. Horses were domesticated and utilized by humans since ancient times. Horses are the species most differentiated into breeds throughout the world (Hall & Raune, 1993). Nowadays because of their power, agility, gracefulness and speed, horses are mostly used for personal pleasure and in sport competitions. In recent years the globalization of horses has been widely recognized being developed as sports animal. The trade, breeding and sports significantly attracted the attention of people. Like other species of animals, horses are also an important component of global biodiversity. If the relationship of various populations is ignored, then remarkable genetic erosion can occur in the global population (Alderson, 2008). Failure to conserve domesticated genetic resources will definitely lead to a situation where a large portion of the horse genome will be on the verge of being lost. The use of the horse as a sport animal or for leisure helps to stimulate the maintenance of genetic diversity within the horse population. On the other hand the wide use of selected popular stallions and their semen is seen as a threat to genetic diversity within the horse population (Bowling and Ruvinsky, 2000).

The contribution of horse breeds to the total number of mammalian breeds in the world being 10.33 %, far outweighs their contribution in terms of animal numbers. Population data is not available for 36 % of all breeds. The population size and structure at breed level are inadequately reported in many parts of the world, especially in context of developing countries (FAO, 2007). As a result of mechanization and globalization, horses have been reinvented as sports and leisure animals while little interest has been placed on identifying the equine populations. Despite a wealth of scientific research in equine sciences, there has not been many studies conducted in order to describe the global population census, breeds and geographical distribution of the horse (Mellor et al., 1999). There are no direct measures at a genetic level, so the status of domestic horse breed populations provides the best available indication of trends in biodiversity.

A sound knowledge of the global horse populations is crucial to know parameters such as existing population size, type and use of the horses, breeds and breeding strategies, epidemiological studies, risk status etc. With regarding the lack of many studies in this field, the present study has been carried out which is based on the Food and Agriculture Organisation (FAO) databases: Domestic Animal Diversity Information System (DAD-IS) and FAOSTAT. The main objectives of this study were to describe:

- a. the number of the horses in the world and by region
- b. the number of horses per 1000 persons in the world and by region
- c. the number of horse breeds in the world and by region
- d. the risk status of the horse breeds in the world and by region

2. Literature Review

2.1. Domestication of the horses

The horse (*Equus caballus*) is a hoofed animal of the family Equidae. Horses, one of the most historically vital domesticated animals to humans, have a special place among our domestic animals and in our hearts. They have played essential roles in the history and developments of civilizations. Humans maintain a mutual trust and strong affiliation with horses, not only for riding and pleasure but also to maintain physical and mental health. They are highly social and intelligent domesticated animals. Horses are not as old as other domesticated species such as sheep, goats, pigs, cattle and dogs (FAO, 1987). Horses acquired a special place next to dogs in recent times because of their close relationship with man. The evolution of domestic horses can be traced from its wild ancestors (Bokonyi, 1987). It is believed that different wild equids gave rise to the different breeds of domestic horses we see today. Many enormous heavy wild horses developed during the Pleistocene period (19th and early 20th centuries) and became extinct by the end of the Ice age (Epstein, 1971; Clutton-Brock, 1999 & Olsen, 2006). Forsten (1988) argued that out of many different varieties of horses in the Pleistocene period, only one species of wild horses survived. That small, single wild horse, referred as *Equus ferus*, is the ancestor of present day domesticated horses.

The domestication of horses is still an ongoing debate. Questions such as when, where and why the horses were first domesticated are still unclear. Horses had historically played an important role in the human progress. They became increasingly powerful components of Eurasian civilizations from the middle of the second millennium BC (<http://www.imh.org/>). The Tarpan (*E. ferus*), a wild European horse and the Przewalski (*E. przewalskii*), a wild Asiatic horse, are regarded as the ancestors of present day horses. Tarpans are small extinct horses with a mouse dun coat and a light underbelly, sooty to black limbs from knees and hocks down, short frizzled mane and a short tail with dark hair (Olsen, 2006). The last captive Tarpan died in Poland in between 1918 and 1919 (Bokonyi, 1974a) and the last wild Tarpan was killed in Ukraine in 1851 (Zeuner, 1963). The Przewalski horse is considered to be

the only remaining wild horse in the world and is the closest living wild relative of the present domestic horses (*Equus caballus*). Przewalski horses are robustly built with sandy tan, dun or reddish bay coat and dark brown upright mane, dorsal and shoulder stripe, barring in their legs, light coloring on their muzzles and bellies, a low set tail and smaller in size to the domestic horse (<http://www.ansi.okstate.edu/breeds/horses/>). Evidence from North Kazakhstan suggests that horses were domesticated in the era during the Copper Age - around 3700 to 3100 BC (Olsen, 2006). However, molecular studies suggest that the diversity of the horses on the maternal side probably originates from several populations in different geographical areas. Vila et al. (2001) suggested that a single point of origin was unlikely as there were multiple successful efforts for horse domestication in different regions. The domestication of horses might have taken a very long time to develop and wild genes have been introduced into domestic genes (Levine, 2006). Horse back riding supported a good indicator of horse domestication which first appeared in the steppes east of the Ural Mountains (Kavar & Dovc, 2008).

2.2. Utilization of the horses

Humans have conquered the world with the aid and sacrifice of the loyal horse in the past. The history of utilization of horses can be traced from the rise and fall of empires, the conquest of entire continents, great battles, developments of transport systems, mail, agriculture, forestry progress and in times of war and peace (Bowling & Ruvinsky, 2000). During the middle of the 19th century, heavy breeds of horses were developed for agricultural and forestry works, coal mines, as power to other pieces of heavy machinery and for pulling carts. With the advent of combustion engines the role of the horses became overshadowed. However, they are still being used in subsistence agricultural regions particularly in Eastern Europe, Asia, Africa, Central and South America. The importance of horses for agricultural work has decreased to insignificant proportions. The exceptions are the use of horses by sheep farmers when herding their grazing sheep (Arnason, 1984) and by “cowboys” at cattle ranches in Western (Iverson, 1994) and Latin (Jordan, 1989 and Bishko, 1952) America. Draft horses still play an important role in rural life, despite the increased mechanization of agriculture. Pack horses and ponies

are still the backbone for the means of transport in some developing countries. Horses have been also used by military forces for expeditions, riding, and transportation.

The mechanization of transport and agriculture increased the attention of many horse breeds for the development of breeds for sport and leisure activities. The role of the horses has mirrored the changes in the human society from war horse to draft horse to today's sport or companion animal (Waran, 2002). In recent times, one of the promising and emerging areas for the use of many breeds of horses is for competitive events or as sports animals. During the last few decades, the equestrian sphere has rather briskly emerged to become a field of wide diversification. The development of leisure riding, diversification of the utilization of horses, and increasing role of horses are of high concern for the developed countries.

The development of leisure activities for horses reflects a regular decrease in the number of draft horses and a constant increase in the number of blood/sport horses (Langlois et al., 1983). Sport horse breeds are intended to be used in competitions for the major international equestrian disciplines of dressage, jumping, three day eventing, racing, trotting, endurance, and vaulting. The development of sport horse breeds and participation at the Olympic level at Stockholm in 1956 had lead to the creation of a new horse market for equestrian sports. The elite horses of different breeds continuously compete at the Olympic Games and World Championship level. In recent years, horses are used in tourism, medical therapy, hobby, social rehabilitation, or social eventing, aesthetic and for cultural values. Horse breeding is characterized by a significant international exchange of breeding material. Besides this, horses are kept for meat purposes in all the regions of the world. Every year about 100, 000 horses are transported for slaughter over long distances within Europe (EU Equus, 2009). FAO estimated that 752, 913 tonnes of horse meat was produced in the world in 2008. Horses became progressively used for transportation, agriculture and forestry, leisure, recreation, sports, meat and therapeutic riding (Hausberger et al., 2008; Splan, 2004 & Anderson et al., 1999). Besides this, the equine industry plays a significant role in the socio-economic and environmental sector of a country.

2.3. Horse populations in the world

A population is a group of individuals that share one or more characteristics on which data can be collected and analyzed. A population can also be characterised as a group of organisms of one species that are interbred and live in the same place at the same time (<http://www.biology-online.org/dictionary/Population>). The distribution of different livestock populations and breeds across regions of the globe is affected by a range of agro-ecological, socio-economic, religious and cultural factors. According to production statistics of the Food and Agricultural Organization of the United Nations (FAOSTAT), in 2008 there were about 1,347 million cattle, 1,078 million sheep, 941 million pigs, 862 million goats, 180 million buffaloes, 18 billion chickens and 58 million horses in the world (<http://faostat.fao.org/>; cited on 15th, May, 2010). Recent data of FAOSTAT (2008) shows that there are 58.8 millions of horses in the world. Cattle are widely domesticated in all regions of the world followed by sheep. The population of horses seems to be quite low, compared to cattle because horses are not productive, but rather leisure or companion animals. According to the FAOSTAT (2006) report the United States reported the highest total number of horses with an approximate number of 9.5 million horses. The data provided by FAOSTAT is strikingly similar to the American Horse Council's own independent study which reported the US horse population to be 9.2 million in 2005. In 2006, the other countries with horse populations over one millions were China, Mongolia and Kazakhstan from Asia, Russia from Europe, Brazil and Argentina from South America, Mexico and Columbia from Central America and Ethiopia from Africa.

According to FAOSTAT (2005), there are 9.1 horses per 1000 persons in the world (Table 1). The figure is highest for Latin America and Caribbean with 46.4 horses per 1000 persons followed by South America with 41, North America with 28.7, Oceania 11.1, Europe 8.9, Africa 4.6 and Asia 3.7 horses per 1000 persons.

Table 1: Number of horses per 1000 persons by regions in 2005

Continents	Number of horses	Number of people (in 1000)	Horses per persons (in 1000)
Africa	4240612	921073	4.6
Asia	14256852	3936535	3.7
Europe	6489242	729420	8.9
Latin America & Caribbean	8562285	184854	46.4
North America	9586060	335175	28.7
Oceania	374657	33559	11.1
South America	15225273	371658	41
Total	58734981	6512274	9.1

Source: FAOSTAT & UNPD, 2005

EU Equus (2009) reported that there were 5.8 million horses in the European Union with Germany and Great Britain having the highest horse populations and Sweden has the highest number of horses per 1000 persons, i.e. 30.9. EU Equus (2001) study reported 4.4 million horses in the European Union member countries but there are not more than 6 millions equine animals or equidae (including horses, donkeys, ass, zebra and their crosses) in the whole of Europe (European Commission, 2010). The average number of horses per 1000 persons among the member countries in the European Union was 11.7 in 2000 (EU Equus, 2001) and 16.6 in 2008 (EU Equus, 2009). Tables 2 and 3 indicate that within the EU, Germany, the United Kingdom and France have the highest number of horses. Sweden, Denmark, Belgium and the Netherlands have the highest number of horses per 1000 persons while Greece, Portugal and Slovakia have the lowest number of horses and horses per 1000 persons.

Table 2 . Total number of horses in some European countries in 2008

Country	Number of horses	Number of people	Horses/1000 persons
Austria	100000	8 265 925	12.1
Belgium	300000	10511382	28.5
Czech Rep.	64126	10188000	6.3
Denmark	150000	5427459	27.6
Estonia	4900	1339000	3.7
Finland	77000	5266000	14.6
France	900000	62998773	14.3
Germany	1000000	82437995	12.1
Great Britain	1000000	60393044	16.6
Greece	27000	11122000	2.4
Hungary	60000	10058000	6.0
Ireland	80000	4221000	19.0
Italy	300000	5877800	5.1
Latvia	13600	2289000	5.9
Luxembourg	4490	461000	9.7
Netherlands	400000	16334210	24.5
Norway	45000	4668000	9.6
Poland	320000	38157055	8.4
Serbia	35000	2003358	17.5
Slovakia	8000	5388000	1.5
Slovenia	22000	2000000	11.0
Spain	559598	43886000	12.8
Sweden	280000	9047752	30.9
Total	7570714	455240953	16.6

Source: EU Equus, 2009

Table 3: Number of horses per 1000 persons in EU in 2000

Country	Number of horses	Number of people	Horses/1000 persons
Austria	81864	8200000	10.0
Belgium	200-250000	10200000	22.0
Denmark	150000	5300000	28.3
Finland	57400	5200000	11.0
France	452000	59100000	7.65
Germany	1000000	82200000	12.2
Greece	35000	10600000	3.3
Ireland	60000	3700000	16.2
Italy	323000	57300000	5.6
Luxembourg	NA	431000	NA
Netherlands	400000	15800000	25.3
Portugal	27000	9900000	2.5
Spain	350000	39600000	8.8
Sweden	250000	8900000	28.1
United Kingdom	965000	58800000	16.4
Total	4376264	375231000	11.7

Source: EU Equus, 2001

NA: Not Available

2.4. Breeds of horses

A breed is an interbreeding group of animals within a species with some identifiable common appearance, performance, ancestry or selection history (Oldenbroek, 2007). Breeds are regarded as the basic units of genetic resources in domesticated species. A breed is usually associated with a particular ecological zone, geographical area and farming system. Breeds have been developed according to the geographic and cultural differences and to meet human food and agricultural requirements. (FAO World Watch List, 2000).

Breeds are defined in different ways:

- “Animals that, through selection and breeding, have come to resemble one another and pass those traits uniformly to their offspring”.
(<http://www.ani.okstate.edu/breeds/>)
- “Either a sub specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group for which geographical and/or cultural separation from phenotypically similar groups have led to acceptance of its separate identity. Breed is very often accepted as cultural term rather than a technical term”. (FAO World Watch List, 2000)
- “A race or variety of men or other animals (or of plants), perpetuating its special or distinctive characteristics by inheritance”.
(<http://www.biology-online.org/dictionary/Breed>)
- “A breed is a group of domestic animals, termed such by common consent of the breeders... a term which arose among breeders of livestock, created one might say, for their own use, and no one is warranted in assigning to this word a scientific definition and in calling the breeders wrong when they deviate from the formulated definition. It is their word and the breeders’ common usage is what we must accept as the correct definition”. (Lush, 1994; The Genetics of Populations)
- “A group of animals that has been selected by man to possess a uniform appearance that is inheritable and distinguishes them from other group of animals within the same species”. (Clutton-Brock, 1987)

Local Breeds: Those breeds that occur only in one country. For example: Jumli is a local horse breed from Nepal.

Transboundary Breeds: Those breeds that occur in more than one country. Transboundary breeds are of two types:

- a. Regional Transboundary Breeds:** Those transboundary breeds that occur only within one region of the seven continents. For example: Hutsul is a regional transboundary horse breed found in Czech

Republic, Poland, Slovakia, Germany, Hungary, Romaina and Ukraine of Europe.

- b. International Transboundary Breeds:** Those transboundary breeds that occur in more than one continent. For example: The Arab horse is an international transboundary horse breed found in all seven continents of the world.

There are hundreds of horse breeds distributed throughout the globe. FAO's Global Databank for Animal Genetic Resources (AnGR) for Food and Agriculture (FAO, 2007) contains information on a total of 7,616 livestock breeds. The number of livestock breeds reported in the FAO databank includes both mammalian and avian species. A total of 786 breeds of horses were reported as of January 2006 which is 10.33 % of the total number of livestock breeds. Excluding 87 extinct horse breeds, there are 570 local breeds, 63 regional transboundary breeds and 66 international transboundary breeds. Out of the 570 local horse breeds, Europe reported the highest number of breeds with 269 local breeds followed by 38 out of 63 regional transboundary breeds. The other details are presented in Table 4.

Table 4: Total number of horse breeds[†] in the world in 2006

Geographic Region	Local	Regional transboundary	International transboundary
Africa	36	7	-
Asia	141	10	-
Europe & the Caucasus	269	38	-
Latin America & Caribbean	65	5	-
Near & Middle East	14	0	-
North America	23	3	-
Southwest Pacific	22	0	-
World	570	63	66

Source: The State of the World's Animal Genetic Resources for Food and Agriculture, 2007

[†] Excludes extinct breeds

As of June 2010, the breeds of livestock database system of Oklahoma State University (OSU) (<http://www.ansi.okstate.edu/breeds/horses/>) have reported 217 horse breeds. Hall and Raune (1993) reported 427 horse breeds. The EAAP Animal Genetic Data Bank contained 707 entries which include 110 horse breeds (Simon, 1992). The livestock dictionary of Mason (1988) includes 592 breeds of horses which also accounted for varieties of horse breeds. A different study illustrating the great diversity of horse breeds in the world is presented in Table 5 and suggests that there were 527 horse breeds in the world.

Table 5: Number of breeds of horses by geographic region

Geographic Region	Number of breeds	Breeds in %
Africa	60	11
Asia	148	28
Europe	209	40
Latin America/Caribbean	32	6
Pacific Islands	30	4
USA/Canada	58	11
Total	527	100

Source: The Genetics of the Horses, 2000

A number of breeds have been developed which illustrates the diversity of the breeds. The adaptability has allowed horses to survive in different environments over the time and to develop distinctive characteristics among breeds. The breed of the horse can be established into different types depending on the temperament (coldblood, warmblood and thoroughbred); nature of work (riding or draft); type of horse (light, heavy or ponies); type of breed (purebred or crossbred). No matter what the classification of horse breeds is, they are found in all regions of the globe. Coldblood or draft horses are generally heavily built with deep bodies, short stocky legs, small ears, large heads, thick coats and less reactive temperaments. These are well adapted for energy conservation and survival in cold climates. Warmblood or

riding horses and trotters are graceful with long slender legs, fine coats, small heads, large ears and other physiological adaptations to aid heat dissipation. They are fast, highly reactive and enduring and are adapted to life in a warmer environment (Hendricks and Dent, 1995).

2.5. Risk status of horse breeds

A total of 1,491 out of 7,616 breeds reported, 20 % were classified as being at risk. Cattle have the highest number of breeds at risk, followed by 23 % for horses. According to Signorello and Pappalardo (2003), 10% of domesticated breeds have been lost in the last century, and a further 20% are at risk of extinction. For more than one-third of all reported breeds, risk status is not known because of missing population data or unreliable information that can only be estimated (FAO, 2007). For example in Africa and Southwest Pacific the population size has not been reported for over two thirds of the breed populations. The lack of knowledge hinders concerted actions and the setting of conservation priorities. There are several important reasons for classification of the risk status of breeds: genetic uniqueness (Raune, 2000), a high degree of endangerment (Gandini et. al, 2004), economic, cultural, scientific, ecological value and optimal allocation of funds (Simianer et. al, 2003). However, the prospects of the breeds of any species largely depend on their present and future functions in livestock systems. When circumstances change, certain breeds are set aside and are faced with the danger of extinction unless alternative strategies are adopted (Oldenbroek, 1999).

2.6. Risk status classification of FAO

Critical: a breed is categorized as critical if the total number of breeding females is less than or equal to 100 or the total number of breeding males is less than or equal to five; or the overall population size is less than or equal to 120 and decreasing and the %age of females being bred to males of the same breed is below 80 %, and it is not classified as extinct (Table 6).

Critical-maintained: are those critical populations for which active conservation programmes are in place or populations are maintained by commercial companies or research institutions.

Endangered: a breed is categorized as endangered if the total number of breeding females is greater than 100 and less than or equal to 1,000 or the total number of breeding males is less than or equal to 20 and greater than five; or the overall population size is greater than 80 and less than 100 and increasing and the %age of females being bred to males of the same breed is above 80 %; or the overall population size is greater than 1,000 and less than or equal to 1,200 and decreasing and the %age of females being bred to males of the same breed is below 80 %, and it is not assigned to any of above categories (Table 6).

Endangered-maintained: are those endangered populations for which active conservation programmes are in place or populations are maintained by commercial companies or research institutions.

Breed at risk: a breed that has been classified as critical, critical-maintained, endangered, or endangered-maintained.

Extinct: a breed is categorized as extinct when there are no breeding males or breeding females remaining. Nevertheless, genetic material might have been cryoconserved which would allow recreation of the breed. In reality, extinction may be realized well before the loss of the last animal or genetic material (Table 6). Extinction is absolute when there are no embryos remaining (Signorello & Pappalardo, 2003).

Not at risk: are those breeds for which the total number of breeding females and males is greater than 1,000 and 20 respectively; or the population size approaches 1,000 and the %age of pure-bred females is close to 100%, and the overall population size is increasing (Table 6).

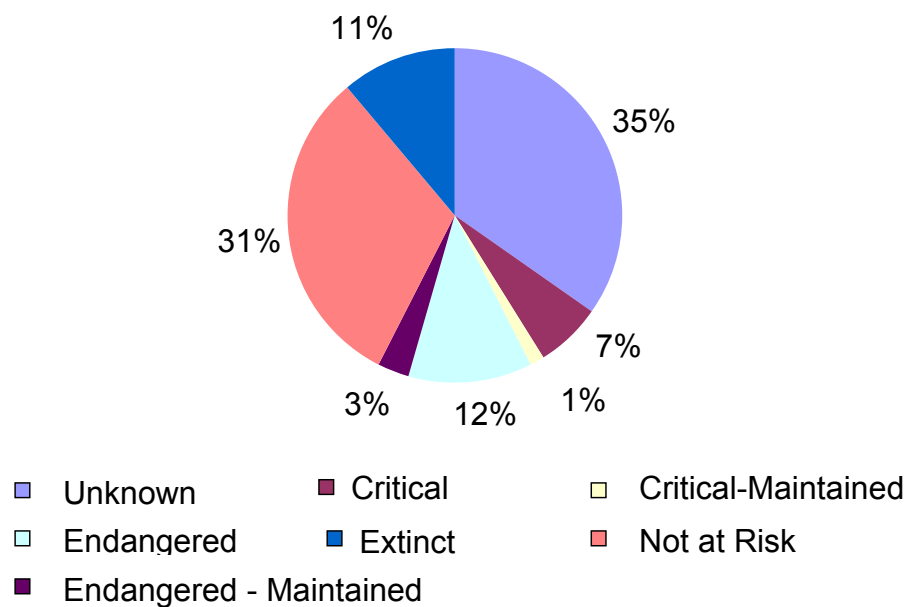
Unknown: a breed for which no data are available.

Table 6: Risk status used by FAO

Risk status	Females	Males	Total breeding animals	Additional criteria
Extinct	0	or 0		Impossible to re-establish the breed
Critical	< 100	or < 5	or < 120 and decreasing and < 80% pure breeding	
Critical-maintained				Critical + conservation or commercial breeding program in place
Endangered	<1000	or < 20	or between 80 and 100 and increasing and > 80% pure breeding or between 1000 and 1200 and decreasing and < 80% pure breeding	
Endangered - maintained				Endangered + conservation or commercial breeding program in place
Not at risk	>1000	or > 20	or >1200 and increasing	Other categories do not apply

Source: Scherf, 2000

There were 786 horse breeds reported to the FAO Global Data Bank until 2006. Out of 768 horse breeds, 272 (35 %) were unknown, 52 (7 %) were critical, 10 (1 %) were critical-maintained, 95 (12 %) were endangered, 24 (3 %) were endangered-maintained, 246 (31 %) were not at risk and 87 (11 %) were extinct breeds. Among 87 extinct horse breeds, Europe alone reported 71 breeds.



Source: DAD-IS, 2006

Figure 1: Risk status of horse breeds in the world

3. Methodology

The data generated for this study was derived by country or territory or concerning the delimitation of its frontiers or boundaries of FAO from member countries of the world. The FAOSTAT and DAD-IS database systems of FAO are the primary sources for developing the information. The data included in the database may be official, semi-official or estimated. The database system of Breeds of Livestock – Oklahoma State University has also been reviewed especially during the study of horse breeds of the world. A World Dictionary of Livestock Breeds, Types and Varieties of I L Mason (1988) also provided a good source of information to input the horse breeds in this study.

3.1 FAOSTAT

<http://faostat.fao.org/>

FAOSTAT database was the main basis for deriving the horse population from 2000 to 2008. The world was divided into seven continents: Africa, Asia, Europe, Latin America and Caribbean, North America, Oceania and South America. Furthermore each continent was divided into sub-regions and from those sub-regions the data of each countries' horse population was collected. For example Africa was divided into East, Middle, Northern, Southern and West Africa; Asia was divided into Central, Eastern, Southern, South-Eastern and Western Asia; Europe into Eastern, Northern, Southern and Western Europe; Latin America and Caribbean into Central America and Caribbean and Oceania into Australia and New Zealand, Melanesia, Micronesia and Polynesia.

3.2 United Nations Population Division (UNPD)

<http://esa.un.org/unpp/index.asp>

World Population Prospects: The 2008 Revision Population Database system of the United Nations Population Division was followed to determine the total human population from each continent in the world for the year 2000, 2005 and 2008. The human population from each continent was assessed with UNPD database system and consequently the horse population in the world from each continent is also assessed from the FAOSTAT database system for

the years 2000, 2005 and 2008. In this way the horse per 1000 persons for each continent and for the world was calculated.

Horses per 1000 persons is the total number of horses in the world by the total human population in the world in the respective years.

3.3 Domestic Animal Diversity Information System (DAD-IS)

<http://dad.fao.org/>

The Domestic Animal Diversity Information System (DAD-IS) is the first globally accessible dynamic multilingual database of Animal Genetic Resources. This database system was the main basis for generating the breeds and risk status of horses for this study. It provides a summary of national breed level information on the origin, population, risk status, special characteristics, morphology and performance of breeds of FAO member countries. It contains more than 14,000 national breed populations of 35 species from 181 countries. Besides breed level information, it provides a virtual library containing a large number of selected technical and policy documents, including tools and guidelines for research related to animal genetic resources.

3.4 Breeds of Livestock Database– Oklahoma State University

<http://www.ansi.okstate.edu/breeds/horses/>

The Department of Animal Science of Oklahoma State University has maintained the breeds of livestock database system since 1995 as an educational and informational resource on breeds of livestock throughout the world. This database system is used to assess the number of horse breeds for this study. It provides a brief description of horse breeds in terms of origin, distribution, typical features, uses and population status. It displayed the information for 217 horse breeds out of 1,063 livestock breeds in the world.

Appendix 3: Local horse breeds in the world

Africa	Western Sudan Pony	Garabarah
Abyssinian	Yagha	Gayo
Bahr-EI-Ghazal		Gemlik
Basotho Pony	Asia	Giawf
Beledougou	Abeia	Guanzhong
Bhirum Pony	Anatolian	Guba
Bobo	Azerbaijan Horse	Guizhou
Bornu	Baguio light horse	Haddian
Calvinia	Baguio pony	Heihe
Cape Harness	Bajau	Heilongjiang
Cape Horse	Bakhtiari	Henan Light Draught
Chadian	Bali	Hequ
Cheval de Nioro	Balikun	Herati
Djerma	Baluchi	Hinis
Dombi	Bangladesh Native Horse	Hirzai
Egyptian	Basseri	Horse (Indonesia)
English WB	Batak	Iyi
European WB	Bima	Jabe
Fleuve	Boeta	Jaf
Fouta	Bohai	Jargalant
Horse (Tanzania)	Bose	Jata
Horse (Uganda)	Bose-Baise Pony	Javakhuri Harness Horse
L'arabe-barbe	Burmese	Jawa
Locale	Buzkashi	Jeju
Logone pony	Cabadin	Jianchang
M'bayar	Cambodian	Jilin
Mogods pony	Canik	Jinjiang
Mossi	Chaidamu	Jinzhou
M'Par	Chakou	Jofi
Namaqua Horse	Cheju	Jumli
Namib horse	Chyanta	Karacabey-Halfbred Arab
Nefza Pony	Cukurova	Karacabey-Nonius
Poney	Dahmaa	Kathiawari
Rancher	Dareshuri	Keheilan
SA Miniature horse	Darkhad	Kerqin
SA Sporting Horse	Datong	Khilan
SA WB	Dawand	Kipriakis Ektrofis
Sahel	Deccani	Kirgiz
Somali Pony	Deliboz	Kiso
Songhoi	Dilbaz	Kohband
Sudan Country breed	Dosanko	Kuda-Lombok
Sulebawa	Ebian	Kuningan
Tawleed	Elenchus	Kushum
Torodi	Flores	Kustanai
Tsawana	Galshar	Lichuan
Vlampeerd	Ganzi	Lokai
West African Pony		

Appendix 3: Local horse breeds in the world

Lombok	Tagaytay light horse	Asturcón pony
Makasar	Tagaytay pony	Augeron
Makra	Tajik Riding horse	Auxois
Malakan	Taleshi	Avarskaya
Maneghi	Tarai Pony	Avelignese Tradizionale
Manipuri Pony	Taropud	Balkar
Marwari	Tattu	Banat
Mazari	Tes	Bardigiano
Megruli Horse	Thai pony	Barra Pony
Merak Sakten ta	Tibetian-Sikang Pony	Barut
Minahasa	Tieling Draught	Bashkir
Miniature horse	Tokara Pony	Belarus Coach
Misaki	Tooraq	Belgian Draft
Miyako	Tsushima Pony	Belgian trotter
Mongolian -Ujumqin	Turkemin	Belgium Riding Pony
Mugalzhar	Turkish Arab	Berrichon
Mytilene Pony	Tushuri	Bessarabian
Nanbu	Uzunyayla	Bityug
Native Racehorse	Wenshan	Black Forest
New Kirgiz	Xiangfen	Black Sea
New Lijiang	Xilinguole	Bohemian moravian belgien
Ngua Noi	Xini	Bosnian
Ningqiang	Yabu	Bosnian Mountain Pony
Noma	Yanqi	Brandenburg WB
Omarqoub	Yargha	Bulgarian Native
Pacu Indonesia	Yiwu	Burgdorfer
Philippine pony	Yomood	Burguette
Qatgani	Yonaguni	Buryat pony
Qazal	Yongning	Busa Pony
Rajshai Pony	Yunnan	Byryatskaya
Rumelain Pony	Yunnan-Lijiang	Calabrian
Samand	Yushu	Camarque
Sandel	Yuta	Carrossier Normand
Sanhe	Zaniskari Pony	Castillon
Saqallwiya	Zhangbei	Catria
Shan Pony	Zhongdian	Charentais
Shandan		Charolais
Shirazi	Europe	Charysh
Shirvan	Akhal-Teke	Chilkov
Shweimaa	Alpine	Chumysh
Sistani	Altwurttemberg	Chuvash
Spiti Pony	American Miniature horse	CB Trotter
Sri Lankan Pony	Amurskaya	Comune
Sumbar-Sandel Arab	Anglo-Arabo-Sardo	Corlais
Sumbawa	Anglo-Normand	Corse
Syrian	Arravani	Cremonese
Taejung	Asino Baio Lucano	Crete

Appendix 3: Local horse breeds in the world

Criollo	Gazal	Konik (Dutch)
Croatian Busa Pony	Gelderland horse	Krk Island Pony
Croatian CB	German Bessarabian	Kumyk Pony
Curly Horse	German Riding Pony	Kun Kinsky
Cushendale	German Sport horse	Kushum
Czech Arab Horse	German Thoroughbred	Kuznet Horse
Czech Riding Pony	German Trakehner	Landais Pony
Czech Trotter	German Trotter	Latvian Coach Horse
Dales Pony	German WB	Latvian Draught
Danish Trotter	Giara pony	Latvian Harness Horse
Danubian horse	Glasinacki	Lenkoran
Deli-Orman	Gocan	Leutstettener
Delta	Goonhilly	Lewitzer
Devon Pack Horse	Great Horse	Lezgian Pony
Dobrogeana	Groningen horse	Lithuanian Cart
Dole Horse	Halfbred of Mezohegyes	Lithuanian heavy draft
Dolny-Iskar	Heavy Draught (Bulgarian)	Local Moldavian
Donska	Heavy WB (Dutch)	Loire
Draver	Heavy WB (German)	Long Mynd
Dulmen Pony	Hebridean Pony	Losina
Dutch draught horse	Henson	Lovets
Dutch Lippizaner	Hessen WB	Lundy
Dutch Miniature Horse	Hispano-Bretón	Maine
Dutch Riding Horse/Pony	Hungarian Cold-blood	Majorcan
Einsiedler	Hungarian Draft	Mallorquina
English Thoroughbred (Czech)	Hungarian horse	Małopolski
English WB (Latvia)	Hungarian Sport Horse	Manx
Eriskay	Hungarian Trotter	Maremanno
Erlenbach	Ialomita	Maremmano tradizionale
Esperia Pony	Icelandic Horse (Danish)	Mecklenburg WB
Estonian Heavy Draught	Icelandic horse (Dutch)	Medjimurje
Estonian Native Horse	Irish Cob	Menorquina
Exmoor (Dutch)	Irish Hobby	Mezens
Falabella Miniature Horse	Irish Pony	Miniature (Belgian)
Finnish Riding Pony	Irish Sport Horse	Minusinsk
Finnish WB trotter	Irski poni	Misko
Finnish WB	Italian Maremmano	Moldavian horse
Flanders	Italian Saddlebreed	Monchina
Flemish Horse	Italian trotter	Monte Horse
Fox-trotter	Jaca Navarra	Monterufoli Pony
Franches-Montagnes	Jutland Horse	Moravian WB
Frederiksborg	Kalmyk	Morvandeaux
French Saddlebred pony	Karakachan	Mountain Horse (Montenegro)
French Trotters	Karatschaewer	Mulassie
Galloway Pony	Karelian Pony	Murgese
Garrano	Kerry Bog Pony	Napoletano
	Kisber halfbred	Narym

Appendix 3: Local horse breeds in the world

Nivernais	Russian (English)	Tarbésan
Nogai	Russian Ardennes	Tavda
Nordland Horse	Russian Cart Horse	Thessalia
North Swedish Horse	Russian Clydesdale	Thuringian WB
Northern Ardennes	Russian Courser	Tiree
Norwegian Heavy trotter	Russian Draft	Tolfetana
Novoalexandrivska Cart	Russian Percheron	Tolter
Novoaltaiskaya	Russian Saddlebred	Tomsk
Ob pony	Sabih	Tori
Obva	Sachsen WB	Torian
Old Don/Cossack	Salernitano	Toriyskaya
Old Kladruby	Samolaco	Tory
Old Kladruby Black	Sanfratellana	Transylvanian
Old Kladruby White	Saône-et-Loire	Tuva
Onega	Sarcidano	Tuva Coach
Ox-Araber	Sardo	Ukrainian Saddle Horse
Paint Horse	Saxony WB	Ukrainian Pony
Palatine Ardennes	Schleswig CB	Upper Yenisei
Paso Peruano	Schweres WB	Vardy
Pedigree Saddle Horse	Scottish pony	Vendéen
Pentro	Senner	Ventasso
Persano	Shtumsky CB	Verkhoyansk
Piebald and Skewbald	Siciliano	Vladimir
Pindos	Siglavi	Vollblutarber
Pineaia	Silesian horse	Voronezh Draft
Pinto	Skewbald and Piebald	Vyatka pony
Pleven's horse	Skyrose Pony	Wels
Podveleski	Slovak Sport Pony	Wielkopolski
Poitevin	Slovak WB	Work Horse
Polesian	Slovenian CB	Wurtemberg WB
Polish CB	Slovenian Haflinger	Yakut
Polo Horse	Slovenian Trotter	Yorkshire Coach Horse
Poni (Lithuania)	Slovenian WB	Zabaykalskaya
Pony of the Americas	Small German Riding Horse	Zangersheide
Pugliese	Small Horse	Zematukai
Pura Raza Gallega	Sokolski CB	Zematukai(Modern type)
Rapid Heavy Draft	Sorraia	Zweibrucker WB
Rheinish German CB	South German CB	
Rheinish WB	Soviet Saddle	Latin America and Caribbean
Riding Horse (Finnish)	Spotted	Atheland
Rila Mountain	Stara Planina	Caballo des trote
Romanian Draft	Strelets	Crillo de Hondureno
Romanian Mountain	Styrian Horse	Criollo Militar
Romanian Sport Horse	Swedish Ardennes	Cuban Trotter
Romanian Trotter	Swedish Riding Pony	Galiceno
Rostopchin	Swedish WB Trotter	Horse (Saint Kitts & Nevis)
Rottaler	Swiss WB	Media sangre

Appendix 3: Local horse breeds in the world

Mexican Pony	Australian Draught Horse	Marchador
OISK	Australian Pony	Morochuco Chumbivilcano
Patibarcino	Australian Stockhorse	Nordestino
Peruana	Australian Waler	Pantaneiro
Ponny Welch	Australian WB	Paulista
Pony (El Salvador)	Brumbie	Pony (Parauguaya)
Pony (Guatemala)	Coffin Bay Pony	Pony (Brazil)
Pony (Honduras)	English Riding Pony	Pony (Peru)
Trotte de andar	English Spotted Pony	Puno pony
Warm blood (Honduras)	French WB	Puruca
Warm blood (Mexico)	German WB	Serrana
	Greenbank Army	Sunicho
North America	Guy Fawkes RNP Brumby	Trocha y GR Colombiano
American Cream Draft	Horse (Papua New Guinea)	Trochador
American Miniature	Irish Sport horse	
American Walking Pony	Kaimanawa 'Wild' Horse	
Appaloosa Pony	Kosciusko Brumby	
Assateague Pony	Local Horse (Tonga)	
Broomtail	Miniature Horse	
Buckskin	Miniature Pony	
Canadian	Namagdi NP Brumby	
Canadian Hunter	Palouse	
Cayuse	Timor Pony	
Chickasaw		
Chincoteague Pony	South America	
Colorado Ranger	Anglo Normando	
Conestoga	Asno	
Cow Pony	Bagul	
Cracker	Brazilain Sports Horse	
French Coach	Brazilian Trotter	
Frencher	Caballo Deportivo Uruguayo	
German Coach	Campeiro	
Indian	Campolina	
Lac la croix Indian pony	Campolino	
Missouri Fox Trotting Pony	Cimarron	
Morocco Spotted	Criollo chileno	
Narragansett Pacer	Criollo chilote	
Newfoundland Pony	Criollo Colombiano	
Quarter Pony	Criollo Parauguaya	
Rocky Mountain	Criollo Uruguaya	
Spanish Barb	Crioulo	
St. Lawrence	Fine English Blood	
Welara Pony	Fine French blood	
	Lavradeiro	
Oceania	Llanero	
Australian Brumby	Marajoara	

Appendix 4: Regional transboundary horse breeds in the world

Africa

Bandiagara
Boer
Dongola
Hausa
Hodh
Koto-Koli Pony
Nooitgedacht Pony
West African Barb
West African Dongola

Asia

Adaev
Bhotia Pony
Chummarti
Dagestan Pony
Karabair
Kazakh
Kurdi
Mongolian
Tanghan
Tibetan Pony
Waziri
Yabu

Europe

Altai
Ardennes
Bavarian WB
Bosnain Pony
Boulonnais
Budyonny
Camargue
Comtois
Estonian Draft
Fell Pony
Finnhorse
French Saddlebred
Furioso-Northstar
Gidran
Gotland Pony
Hutsul
Kladruby
Knabstrupper
Merens Pony
Mur Island
Nonius
Noric
Norman Cob
Pinkafeld
Polish Konik

Posavina
Pottok
Silesian Nork
Tarpan
Tinker
Trakenher
Tuigpaard
Westphalian WB

Latin America & Caribbean

Azteca
Costarricense de Paso
Creole

North America

Canadian
Kanata Pony
Mustang
Sable Island Pony

South America

Criollo Argentine

Appendix 5: International transboundary horse breeds in the world

Akhal-Teke	Oldenburg
American Paint	Orlov Saddle Horse
American Saddle Horse	Orlov Trotter
American trotter	Palomino
Andalusian	Paso Fino
Anglo-Arab	Percheron
Anglo-Kabarda	Peruvian Paso
Appaloosa	Przewalski
Arab	Purebred Spanish
Barb	Quarter Horse
Belgian draft	Russian trotter
Belgian WB	Shagya Arab
Breton	Shetland Pony
Caspian	Shire
Cleveland Bay	Soviet Heavy Draught
Clydesdale	Suffolk
Colombiano	Swedish WB
Connemara pony	Tennessee Walking horse
Creole	Tersk
Dales	Thoroughbred
Danish WB	Welsh Pony
Dartmoor Pony	
Don	
Dutch WB	
Exmoor Pony	
Falabella Pony	
Fjord	
Friesian	
Hackney	
Hackney Pony	
Haflinger	
Hanoverian	
Highland Pony	
Hispano-Arabe	
Holstein	
Iberoamericano	
Icelandic Horse	
Irish Draught	
Kabarda	
Karabakh	
Karachai	
Lippizaner	
Lusitano	
Mangalarga	
Morgan	
New Forest pony	

Appendix 6: Critical and Critical-Maintained horse breeds in the world

Critical Breeds

Africa

English WB
Horse (Uganda)

Asia

Burmese
Deccani
Sri Lankan Pony
Tieling Draught

Europe

Altwurttemberg
American Miniature horse
Anglo-Arabo-Sardo
Ardenne
Avelignese Tradizionale
Bosnian
Criollo
Curly Horse
Delta
Dulmen Pony
Finnish Riding Pony
Fox-trotter
Franches-Montagnes
Karakachan
Karatschaewer
Landais Pony
Leutstettener
Maremmano
Maremmano tradizionale
Mur Island
Napoletano
Old Kladruby White
Paint Horse
Palatine Ardenne
Paso Peruano
Persano
Polo Horse
Pony of the Americas
Romanian Draft
Romanian Sport Horse
Rottaler
Samolaco
Sarcidano
Senner

Slovak Sport Pony
Slovenian Trotter
Tarpan
Tolter
Ukranian Pony
Vollblutarber
Zematukai (Modern type)

South America

Sunicho

Critical-Maintained Breeds

Asia

Misaki
Miyako
Noma
Tokara Pony
Tsushima Pony
Yonaguni

Europe

Estonian Heavy
Draught
Majorcan
Skyrose Pony
Sorraia
Zematukai

Declaration

To the best of my knowledge and belief, the work presented in this thesis is my own as a part of double degree program from Christian Albrechts University, Kiel and Swedish University of Agricultural Sciences, Uppsala. I, hereby, declare that I have not previously submitted this material either in whole or in part for a degree at this or any other institutions. Where other sources of information have been used, they have been highly acknowledged.

.....
Place and Date

.....
Signature

Rupak Khadka
Matriculation Number: 486022