

Current Dynamics of Animal Conservation and Development in Developed and Developing Countries: A Review

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Abstract

The objective of this paper was to review the current dynamics of animal conservation and development in developed and developing countries. The global population is expected to increase from 6.2 billion to 9.2 billion in 2050 year. Reports indicated that currently 7040 local breeds of animal diversity have been identified in the world in which most of these have been found in developing countries. Food production to support the ever increasing population needs to increase by at least 60% and 85% globally and in developing countries respectively. Reports have shown that high producing livestock breeds have been increased while suppressing the low producing animals regardless of their adaptability to the changing environment. Various scholars indicated that the risk status of 36% of animal breeds remained in a questionable event not because of natural selection but human case. Besides; references have shown that there were experiences of fast structural change with high proportions of breeds at-risk and already extinct confirmed to include 38% of chicken, 35% of pig, 33% of horse, and 31% of cattle breeds globally. Plus, Scholars have approved that there are many breeds listed under endangered such as African penguin, African wild dog, Ethiopian wolf, Ethiopian sheko cattle, Ethiopian Dinnar donkey, Asian elephant and Persian leopard. Similarly, evidences have explained that the American paddlefish, Fossa, whale shark, Mountain zebra and cheetah found to be under vulnerable conditions. .Many researchers have noticed that most animal conservation programs and methods have been developed suited to developed countries. References have indicated that livestock could be conserved under in-vivo and in-vitro methods. Additionally, the in-vivo could be classified as in-situ in-vivo and ex-situ in-vivo showing variable financial impact under developed and developing countries. The in-vitro animal conservation method has embraced the haploid (semen and oocyte) and diploid (embryo and DNA) conservation approaches remained to be important to be maintained under gene bank. The in-vitro approach has been proved to be practical in developed countries while affected by financial and knowledge barrier in the case of developing countries. Literatures have informed that the animal conservation experiences many significances in proving livestock variation, food security, granting change in conditions and providing cultural and historical importance .Reports have confirmed that there have been many factors affecting animal conservation and development such as globalization, Finance and fund, changes in animal production system, People preferences and attitude, Marketing conditions, climate change and variability, Disease and disasters and animal Biotechnology advancement. All in all, it can be concluded that there have been experiences of unregulated animal genetic erosion both in developed and developing countries. It can also be ascertained that there were poor attention and awareness about the impact of animal genetic erosion against conservation in developing countries. It is therefore recommended the national, regional and international governmental and non-governmental institutions to collaborate in conserving the animal genetic diversity in the world in general and the huge animal resources in developing country in particular as a whole.

Keywords: Conservation, Animal, dynamics, Developed countries, Developing countries

INTRODUCTION

The global population is expected to increase from 6.2 billion to 9.2 billion in 2050 year (World Bank, 2008) and food production to support this population needs to increase by at least 60% while sustainably conserving the bio-diversity globally (WSPA, 2012; IFAD, 2009) and developing countries to the most could be expected to account for 85% of the increased food demand from diversified agricultural sector and improvement of through introduction of technology such as improved breeds could be inevitable (FAO, 2007) and has also kicked off as early as 20th century (FAO,2009).

Reports indicated that currently 7040 local breeds of animal diversity have been identified (Hoffmann, 2009 ;) and trans-boundary breeds have already characterized to be 1050 in number globally (FAO, 2009). Different authors also disclosed that most European breeds have been well defined and isolated phenotypically and genetically and about two-thirds of reported breeds have currently found in developing countries though remained most of animal uncharacterized remarkably (Pilling, 2007; FAO; 2011).

Changing environmental conditions (rapid increase in population, global warming, disordered structuring, and environmental pollution) change the flora and fauna of the world irreversibly and negatively (IBC, 2009).

Studies carried out have showed that 27,000 animal and plant species per year disappear from nature forever (Mehamet *et al*, 2012; Mara *et al*, 2013). Different scholars explained that currently production of farm animals verges on uniform pattern in the world (Pilling, 2007; FAO; 2011) and selecting animals merely having better production performances (DAGRIS, 2010). Similarly, different reports confirmed that culture lineages of animals with improved efficiencies have shown better chance of selection for next generation regardless of the future threat of climate change (Hoffmann, 2009).

However, no one has emphasized the merit of local animals to environmental conditions (Woelders, et al, 2006: Avendano, 2009) such as resistances for emerging diseases and have been ignored from conservation practices contributing impact to their genetic erosion and dilution in unregulated exotic breed introduction conditions globally (Lauvie, 2009; Campbell *et al*, 2011) and to the most in developing countries (Hoffmann, 2009; Blackburn *et al*, 2008).

Besides; researchers reported that changes in environmental conditions and bioterrorism have shown effect not only animals but also human though the local animals have been adaptive and served as an insurance for local society (Hiemstra *et al*, 2009; FAO, 2007) and these factors have threatened the future fate of many animal species and lineages seriously (Hoffmann, 2009;FAO,2009) and to the most hindered the food demand of the highly increase population growth globally (Collin,2008) and in developing countries at large (Solomon,2009).

Different authors explained that animal genetic resources diversity played significant role for food security and rural development (CBD,2009;FAO,2009) and much of the world's surviving animal genetic resources diversity have been found (USAID,2007) and still remain to occur in developing countries (Solomon,2008;FAO,2007) and plenty of authors informed that existences of animal biodiversities have allowed farmers to select stock or develop new breeds in response to changing conditions, including climate change, new or resurgent disease threats, new knowledge of human nutritional requirements (CBD,2009) and changing market conditions or societal needs globally (FAO,2009) and largely in developing countries (Albuquerque,2006;Solomon,2008). The change in climate conditions have been observed (Barker, 2009) and still happened to be potentially difficult to predict currently (FAO, 2007).

Plenty of scholars explained that in the second half of the 20th century the improvement of animal breeds have accelerated (Gollin *et al*,2008) and causing some breeds to increase worldwide (DAGRIS,2007) while other have decreased or even become extinct (FAO,2009). Reports also indicated that introduction of exotic breeds (FAO,2009) and other social and economic pressures have exposed locally adapted indigenous breeds to the risk of extinction (FAO,2008;CBD,2009) and could lead to a loss of potentially valuable genetic diversity in the long run (Gollin *et al*,2008) though there have been enhancement in boosting production from introduced animals (Gibson et al,2005;FAO,2009) and still continued to translocation animals from one corner of the globe to another in a short mean time period (Barker,2009;FAO,2007).

Domesticated animals seem to have been neglected perhaps because they are the products of human selection and not considered "natural" and only during recent decades the idea of conservation of animal genetic resources has become increasingly a part of animal breeding, both in theory and practice resulting in increasing global concern about the potential long term consequences of loss of domestic animal diversity (FAO, 2007: CBD, 2009).

Various scholars indicated that the risk status of 36% of animal breeds remained questionable event (CBD, 2009) and unknown threats and loss within animals breed diversity found to occur (FAO, 2009). . About 9% of reported breeds are extinct and 20% are currently classified as being at risk (FAO, 2007). Different reports indicated that the species involved in various production and marketing systems showed currently fast structural change with high proportions of breeds at-risk and already extinct confirmed to include 38% of chicken breeds, 35% of pig, 33% of horse, and 31% of cattle breeds (FAO, 2009) and to the most economic and market drivers also made up 28.5% threats to animal genetic resources (FAO, 2009) globally where the majority found in developing countries (.Barker, 2009).

However; over the past twenty years substantial efforts and progress have been made in conserving animal genetic resources for food and agriculture (AnGR). Across continents and regions: national programs, NGOs (e.g., breed associations), and producer based activities have been initiated and plan of Action for animal genetic resources developed globally.

Moreover; the Global Plan of Action for Animal Genetic Resources was adopted by 109 countries in Interlaken, in September 2007 aiming to promote a pragmatic, systematic and efficient overall approach (CBD, 2009) which harmoniously addresses the development of institutions, human resources, cooperative frameworks, and resource mobilization for the sustainable use (Pilling, 2010) and conservation of animal genetic resources (Mehamet *et al*, 2012). It has been reported that it contains five strategic priorities for action on conservation (FAO,2007) and various countries found committed themselves to develop national conservation policies by establish or strengthen in situ and ex situ conservation program (CBD,2009) and also developing and implementing regional, national and global long-term conservation strategies (FAO,2008) as well as enabled to develop approaches and technical standards for genetic conservation including animals (Gibson,2006).

Besides; it has been reported that there exist both well-established and newly formed national gene banks operating and providing genetic security for commercial and rare breeds globally (CBD, 2009). Plus, at the global level a more formal structure among nations leveraging their mutual interests in animal genetic resources conservation through direction given via FAO has become prominent (FAO, 2007).

Different authors reported that the ex-situ approach for animal genetic resources conservation might be less relevant strategic option for Africa when considering in terms cost (FAO,2007) and availability of huge uncharacterized animal bio-diversity (Barker,2009) while the in-situ conservation utilization of animal genetic resources is possibly the most cost-efficient method of choice in developing countries with a potential to contribute to food security (Pilling,2009)and household income improvement of the livestock keeping community (Hoffmann. I, *et al*, 2009).

2. Review

2.1. Definition of animal genetic resources conservation and development related terms

2.1.1. Definition of Animal Conservation and Preservation

References defined conservation as a means of the management of animals for human use, "that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations (CBD, 2009) and also reports showed to include and touch animal science and husbandry as a whole to mitigate the threats of future animal genetic resources and keep from dramatically loss of animal diversity (FAO, 2009).

References also defined preservation and have given a narrower definition which is: "That aspect of conservation, by which a sample of animal genetic resources population is designed to an isolated process of maintenance, by providing an environment, free from the human interference which might bring about genetic change which could be "in situ", whereby the sample consists of live animals in a natural environment, or it may be "ex situ", whereby the sample is placed, for example, in cryogenic storage (FAO, 2007;CBD,2007).

2.1.2. Definition of uniqueness

Uniqueness refers to the fact that no other population has the same ancestry, environmental adaptation, human selection, and appearance or production characteristics (FAO, 2007).

2.1.3. Definition of breed

A breed is a cultural rather than a biological or technical entity (Eding, 2008). A breed covers groups of animals having similar characteristics that depend on geographical area and origin (DAGRIS, 2007).

2.1.4. Definition of habitat loss

Different sources indicated that habitat loss happen when an animal's ecosystem is not maintained causing losing their home and are either forced to adapt to new surroundings or perish (Pilling, 2009). Pollution, over exploitation, disease (FAO, 2008), and climate change cause to risk of endangerment or extinction (CBD, 2009).

2.1.5. Domestic animal diversity

Genetic variation among species, breeds, strains and individuals for all animal species which have been domesticated to meet human needs for food and agricultural production, and their immediate wild relatives(FAO,2009;CBD,2007)

2.1.6. Genetic diversity

Genetic diversity refers to any variation in nucleotides, genes, chromosomes or whole genomes of organisms (Wang et al., 2009).

2.1.7. Characterization

All activities associated with the identification, quantitative and qualitative description, and documentation of breed populations and the natural habitats and production systems to which they are or are not adapted (DAGRIS, 2007)

2.1.8. Endangered species

Many scholars explained that endangered species have been exposed to human interferences (CBD, 2007) and has imposed very high risk of extinction in the near future (FAO, 2009). Similarly, endangered species have been defined as population of organisms which has been and still exposing a high risk of becoming extinct because it is either few in numbers, or threatened by changing environmental conditions, as a result of predation parameters and to the most human interferences (CBD, 2007; FAO, 2007).

Reports showed that many species have been imposed under endangered conditions such as African Penguin, African Wild Dog, Asian Elephant, Asiatic Lion, Blue Whale, Bonobo, Bornean Orangutan, Chimpanzees, Dhole, Ethiopian Wolf, Hispid Hare, Giant Otter, Giant Panda, Goliath Frog, Gorillas, Green Sea Turtle, Grevy's Zebra, Hyacinth Macaw, Japanese Crane, Lear's Macaw, Malayan Tapir, Markhor, Persian Leopard, Proboscis Monkey, Pygmy Hippopotamus, Red-breasted Goose, Rothschild Giraffe, Snow Leopard, Steller's Sea Lion, Scopas tang, Takhi, Tiger, Vietnamese Pheasant, Volcano Rabbit, Wild Water Buffalo, Ethiopian Sheko cattle, Ethiopian Dinnar donkey and many others causing losing their cultural interest, economical potential and scientific use in the unprecedented global change conditions (DAGRIS,2007).

2.1.9. Vulnerable species

Different sources indicated that vulnerable animal species face a high risk of extinction in the medium-term and observed to happen that many species have been exposed under vulnerable conditions such as African Elephant, American paddlefish, Clouded Leopard, Cheetah, Dugong, Far Eastern Curlew, Fossa, Galapagos Tortoise, Gaur, Blue-eyed cockatoo, Golden Hamster, Whale Shark, Crowned Crane, Hippopotamus, Humboldt Penguin, Indian Rhinoceros, Komodo Dragon, Lesser White-fronted Goose, Lion, Mandrill, Maned Sloth, Mountain Zebra, Polar Bear, Red Panda, Sloth Bear, Takin, Yak and many others faced to challenges of their natural habitat loss (DAGRIS,2007;CBD,2007;FAO,2009).

2.1.10. Livestock exchange

References showed that most livestock production systems depend on species originally domesticated elsewhere and breeds developed in other countries and regions, making most countries highly interdependent with respect to animal genetic resources (FAO, 2007). Climate change will increase the need to maintain wide access to animal genetic resources in the interests of future food security (FAO, 2007). Livestock breeding and production systems are complex and knowledge intensive. New species or breeds may replace the current ones as single new components in a production system or they may be changed together with other components of a system, including knowledge components (CBD, 2009).

Scientists reported that in human-managed systems, 'establishment' of new species or breeds depends on how many components of the old production system can be transferred to the new area/system (Woelders,2006)) and on the socio-economic conditions (FAO, 2008) and emphasize that successful introduction of new breeds has been based on several production traits (DAGRIS,2007:FAO,2007) while introduction to take advantage of single traits has not proved sustainably important (Barker,2009);FAO,2009).

2.1.11. Loss of Farm Animal Genetic Diversity

Different authors explained that in the last few decades, farm animal genetic diversity has rapidly declined, mainly due to changing market demands and intensification of agriculture moving away from small production systems to large commercial systems, and as a result, selection goals and production environments are now very similar throughout the world (Hoffmann. I, 2009). Modern reproductive technologies have allowed a large number of progeny to be produced from a single individual (Hiemstra,2009)) and contemporary transport has enabled the distribution of germplasm around the world rapidly and efficiently (CBD,2009;FAO,2008) and Livestock diversity has also been diminished by many breeding programs carried out by national (Mara *et al*,2013) and international companies which place intense selection pressure on few breeds (DAGRIS,2007) and to the most even loss of important genetic resources diversity including livestock (FAO,2007).

Animal Genetic Resources Conservation and Development

Different sources showed that the objectives of animal conservation could include not only ensuring the survival and integrity of the target animal population, but also improving its reproductive rate and performance while maintaining its specific adaptive features (Kefyalew,2013;CBD,2007) and the conservation of animal genetic resources showed advancement from the in vivo to in vitro as a consequences of conservation technology development in addition to existences of diversified animal genetic resources previously while the human interferences were low (Claudia *et al*, 2012; FAO, 2009).

2.2.1. Animal Genetic Resources Conservation

Different sources indicated that conservation measures for threatened breeds have already been established in some countries (FAO, 2007;CBD,2007;Mizeck et al,2014) and have been priority of the *global plan of action for animal genetic resources* (FAO, 2007;DAGRIS,2007). Reports also showed an increase in disturbance and catastrophic weather events and newly emerging diseases could cause loss of important animal genetic resources (FAO, 2008). Similarly, different authors explained that local and rare breeds which have been geographically isolated (endemic) could be lost as a result of climate change disasters (Mezick, 2014; FAO, 2008) and to secure against such disasters it has been found critically important to characterize the animal genetic resources and subsequently to build inventories as well as gathering information regarding to the spatial distribution of valuable animal genetic resources.

Similarly, most conservation programmes are based in developed countries with strong collaborations between gene banks and the animal breeding industry (FAO, 2007). In developing countries, few breeds of the five major species are covered by conservation programmes, and programmes are of variable quality (FAO, 2007) and reports indicated that sustainable use of animal genetic resources have remained at its infancy (CBD,2009) and yet not conservation and development pace at faster rate to fulfil the current population pressures need (Muramatsu,2011) and the farmers in the developing country deserve full support to obtain the best information on the locally available animal genetic diversity(Tamina *et al*,2009) and their conservation methods(Eric *et al*,2007).

2.2.2. Method of Animal genetic Resources Conservation

References indicated that countries have already subscribed to the Convention on Biological Diversity and have been obliged to develop strategies for the conservation of biological diversity including animal genetic resources

(BCD,2007;FAO,2009) though the fund allotted were unable to cover the costs for preserving the entire diversities of breeds (Kefyalew,2013). Besides; different authors explained that before planning for conservation of animals it has been important to identify the breeds that should be included (Mizeck *et al*,2014) and to allocate an appropriate amount of monetary (FAO,2008) Similarly. Reports also showed that it could be best strategy to maintain the highest neutral genetic diversity within the whole animal population to tackle the unknown future challenges in animal genetic resources (Hoffmann,2007) and the unknown values of animal for future scientific purpose (Claudia *et al*,2012).

2.2.2.1. In vivo Animal Genetic Resources Conservation

2.2.2.1.1. In situ in vivo animal genetic resources conservation method

Different sources defined in situ in vivo conservation as the maintenance of animal breeds in their natural breeding tract through their sustainable utilization (DAGRIS,2007) and has been elaborated as the best approach for conservation of animal genetic resources where these could be used as options of livelihood for farmers(Claudia *et al*,2012).Similarly, reports confirmed as this method could be the most practical and economically feasible method recommended for conservation of livestock genetic diversity in eastern Africa() and the rest of the developing countries. Others also reported that in-situ in vivo conservation enabled animal populations to continue, adapt, evolve and be selected for use in their natural environments (Hoffmann,2007) and at most could be carried out at any level, in any country and with the skills and resources already available (CBD, 2007;FAO,2010).

2.2.2.1.2. Ex situ in vivo animal genetic resources conservation method

References indicated that ex situ in vivo animal genetic resources conservation could be defined as the maintenance of pure-bred nucleus animal flocks in organized governmental or non-governmental responsible institutions which can form a repository of the pure breed (CBD,2007) and has also been reported that it needs to be linked to farmer livelihood through closed or open nucleus breed improvement schemes to enhance the feasibility and sustainability of the ex situ in vivo conservation(FAO,2010;Hoffmann,2009;CBD,2007)

2.2.2.2. Ex situ in vitro Animal Genetic Resources Conservation Method

Different sources defined ex situ in vitro conservation method of animal genetic resources as one method of the preservation of animal genetic material in haploid form (semen and oocytes), diploid (embryos) or DNA sequences and which enhances maintaining of declined diversity of animal resources (Hoffman,2009). Similarly, reports also proved that ex situ in vitro conservation programs of animal genetic resources have focused interest on cryopreservation of gametes, embryos and somatic cells as well as testis and ovarian tissues which could support lengthening of the animal genetic resources lifespan even after the death (Sonea *et al*,2010;FAO,2007;CBD,2009).

However, different authors also announced that although significant progress has been made in semen, oocytes and embryo cryopreservation of several domestic species though standardized procedure has not been yet established in the animal genetic diversity endowed countries in general and developing countries in particular (FAO,2009). Others also reported that one of the major issues surrounding genome banks could be the amount and type of animal genetic materials that need to be stored (CBD,2007) and which has been approved to be a function of the intended future use of the animal genetic material(Claudia *et al*) and a gene bank of male and female animal genetic resources formed from the largest number of individuals would be ideal to avoid inbreeding of the animal genetic resources diversity globally (Blackburn,2009) and to the most in developing countries (Kefyalew *et al*,2013) as far as the cost (FAO,2007) and the potential diversified animal resources could have been fully characterized (CBD,2007;DAGRIS,2007).

1.1. Overview on Animal Genetic Resources Conservation Development

Different sources indicated that conventional slow freezing was introduced first (CBD,2007) and has currently improved to use the gold standard for cryopreservation of embryos (DAGRIS,2007) and has involved typically the use of single cryo-protectants in low concentrations (approximately 1 to 2 M) to minimize chemical and osmotic toxicity (Hoffmann,2009) and attempts to maintain a balance between the various factors that influence cell damage (Blackburn,2009).and to the most reports showed that slow freezing could give acceptable results for oocytes of species that are not sensitive to chilling such as cat, human, and mouse (FAO,2009;CBD,2007) even though bovine and porcine oocytes have shown strong sensitivity to chilling (FAO,2010) and yield poor results following slow cooling (Kefyalew *et al*,2013).

2.3.1. Animal Genetic Resources Conservation technology development

References showed that the development of embryo freezing technologies revolutionized animal breeding (CBD, 2007) and caused important advancements in cryobiology cell biology (Pilling, 2008) and domestic animal embryology (Hoffmann, 2009) and have enabled the development of embryo preservation methodologies for cooling resistant large (FAO, 2007), small ruminant ad poultry species in the world (FAO, 2009). Similarly, cryo preservation technologies have been developed for extremely cool sensitive pig embryos (DAGRIS, 2007) while horse embryo cryopreservation has remained still at its infancy stage (CBD, 2007).

1.1.1.1. Conservation of Animal Genetic Resources Using Semen

Different sources showed that semen could be one of the most practical means of storing germplasm due to its abundant availability and ease of application (FAO,2010) and various authors added that stored spermatozoa could be introduced back into existing populations either immediately or decades or centuries afterwards (Jonathan,2010).

Moreover; others also explained that stored frozen-thawed semen from genetically superior males of threatened animal breeds could be used for artificial insemination (CBD,2007) and in vitro fertilization (Hoffmann,2007) and has the potential to protect existing diversity (Pilling,2010) and maintain heterozygosity while minimizing the movement of living animals (CBD,2007) and on average conception rates using semen showed difference between animal species and was found fairly high in cattle, pigs, goats, and sheep (Sonea *et al*,2012).

2.3.1.2. Conservation of Animal Genetic Resources Using Embryos

Different sources explained that embryo cryopreservation has allowed the conservation of the full genetic complement of both dam and sire and has created tremendous opportunities for maintaining heterozygosity and population integrity though it has found more complex and costly procedure than semen cryopreservation (Claudia *et al*,2012) and a large number of embryos would be required for complete reconstruction of a population and could be unlikely to be available from donor females of endangered breeds (Pilling,2010).

2.3.1.3. Animal genetic resources conservation using Oocytes

Different sources defined that oocytes are large cells having low surface to volume ratio and surrounded by zona pellucida (CBD,2007) and has been found immediately adjacent to the oocyte and has also be neat to the corona radiata cells that have long cytoplasmic extensions which penetrate the zona pellucida ending in oocyte membrane (Pilling,2008). Additionally; oocytes are extremely sensitive to chilling and the technique is not as established as in semen or embryos, due to the fact that oocytes typically have a low permeability to cryo-protectants (Hoffman, 2009).

However; reports indicated that there has been no consistent oocyte cryopreservation method established in any species even although significant progress has been observed in animal species (CBD,2007) and offspring have been born from frozen-thawed oocytes in cattle, sheep, and horses (FAO,2010). Others also explained that oocyte have been suffering considerably and affected by morphological and functional damage and has even to depend the extent of cryo-injuries on the animal species (Jonathan,2010) and the origin preservation methods (Solomon,2010) and improvement of oocyte cryopreservation has been found difficult and not yet clearly understood (DAGRIS,2007).

2.3.1.4. Animal genetic resources conservation from somatic cells

Different sources reported that somatic cells could be defined as an additional resource which can be retrieved for gene banking in the cases of emergency wherein gametes cannot be collected or stored (Jonathan,2010) and tissues could be taken from living animals or shortly after death().and these tissues has remained to be saved via cryopreservation (DAGRIS,2007).

2.4. Importance of Animal Genetic diversity conservation

2.4.1. Prove Animal Genetic variation

Different sources indicated that the genetic variation that exists among farm animals has been a basic requirement for efficient development and improvement of populations and It has also been indicated animal genetic variation to show whether a population can withstand () and live with changes in the environment in an unpredictable conditions (FAO,2007;CBD,2007;Pilling,2010).

2.4.2. Ensure Food Security

References indicated that Farm animals play a major role in global food supply and has contributed 30 – 40% of the energy intake of all humans derives and this proportion has been increasing gradually over time (Eric *et al*, 2014). In addition to food products, farm animals have been the source of other products, such as wool and leather, and have also been used for power, sports and recreation (Jonathan, 2010) and to the most have been also be important in national and regional politics through their contributions to trade (FAO, 2009) and landscape maintenance and represent historical and cultural value (CBD, 2007).

2.4.3. Enhance Commercial Breeding Programmes

Different resources showed in modern breeding programmes that there have been very strong selection practices in commercial breeds and populations have been selected based on only a very limited number of individuals especially on the paternal side (Solomon,2012) and this has caused reduction in animal genetic resources variation (CBD,2007) and increases the likelihood of inbreeding (FAO,2010) and to the most it has been found important in such breeding programmes that the relationships and selection intensity could better be optimized so that genetic variation in the population could be maintained over time() and the effective population size would not become too small (DAGRIS,2007).

2.4.4. Evaluation of threats

Different sources showed that a large number of the minor farm animal populations around the world have threatened (CBD, 2007) and globally at least a dozen go extinct annually as a result of genetic erosion (Barker, 2008) and various sources also designed a standard for categorization of animal genetic resources status to assist in evaluating threats to populations and has represented a valuable support to national measures that have to be introduced (FAO, 2007).

2.4.5. Granting Changes in Conditions

References indicated that conservation of animal genetic resources could provide security against changes in conditions and to mention some out of many intensive farm and farm animal production have been influenced by extensive use of fertilizers, feed concentrates and veterinary drugs (DAGRIS,2007) and to the most the presence and conservation of animal genetic diversity would essentially support to maintain production of animal genetic resources under new conditions (Solomon,2012) and to fight against new and fast-evolving diseases (FAO,2009). Besides; the strategic value of animal genetic resources could be very high and occurrences of loss of animal genetic diversity following epizootic outbreaks over vast areas initiated different countries to conserve adequate animal genetic resources material in secure gene banks so that targeted breeding programmes could be sustainably continued globally (CBD, 2007).

2.4.6. Cultural and Historical Importance

Reports showed that local or regional animal breeds are often of great cultural and socio-economic significance since they can provide the means of livelihoods based on niche production and use of marginal resources in areas where modern intensive farming is not possible (Claudia *et al*,2012) and animal genetic resources often represent important elements in historical and cultural development and has remained to highlight the importance of adaptation and co-existence between humans and animals (CBD,2007). It is also reported that animal Breeds result from long-term regional adaptation processes could serve as an important sources of food production and sales in the world and to the most in developing countries where they are endowed to be found (FAO, 2010).

2.5. Factors Affecting Animal Genetic Resources Conservation and Development

Although precise data and detailed knowledge is limited and a better understanding of the global status of AnGR is needed, it is generally accepted that genetic diversity in farm animals is under threat and that action is needed to halt the loss of farm animal genetic diversity. Important threats are related to animal diseases, exchange practices, indiscriminate cross-breeding, and intensification of production systems or changing consumer demands in general and the detail factors are explained bellow (FAO, 2010; FAO, 2007; FAO, 2008; CBD, 2007).

2.5.1. Globalization

Due to the activities of man, populations of many plant and animal species have become small, fragmented and isolated. Between 1993 and 2020, population growth, urbanization and increased incomes are expected to more than double meat and milk consumption in developing countries between 1993 and 2020 and considered as livestock revolution (FAO,2010) and this revolution has shown a major increase in the share of developing countries in total livestock production (Jonathan,2010) and consumption, putting greater stress on grazing resources (Kefyalew,2014) and triggering more land-intensive production closer to cities (FAO,2008). It has also been associated with rapid technological changes (Claudia *et al*, 2012) and livestock production shifting from a multipurpose activity with mostly non-tradable outputs, to one focused on food and feed production in the context of globally integrated markets (CBD,2007;FAO,2009).

Besides; globalization trends may be expected to result in a wider use of a limited number of breeds, standardization of consumer products (FAO,2009) and a move towards large scale production (CBD,2007). Retailers and supermarkets will be leading actors in the globalization process. Vertical integration is expected to become the primary business model on a global scale. Furthermore, globalization may adversely affect smallholder competitiveness and threaten the sustainable use of local breeds (CBD, 2007; FAO, 2009).

2.5.2. Changes in Production System

The environmental impacts of climate change that are likely to affect livestock development include changes in disease challenge, changes in fodder and water availability, and land degradation. The specific direction of change – whether demand for AnGR suited to extensive or to intensive systems will increase – is difficult to predict. Livestock products from intensively managed livestock systems will tend to become costlier if agricultural disruption leads to higher grain prices. However, intensively managed livestock systems will probably adapt more easily to climate change than crop systems (FAO, 20010).

This will not be the case for pastoral and crop-livestock systems, where livestock depend on the productivity and quality of the local feed resources. Extensive systems are more susceptible to changes in the severity and distribution of livestock diseases and parasites (CBD, 2007). Negative impacts of climate change on extensive systems in the dry lands are, therefore, expected to be substantial. Climate change is likely to have its greatest adverse impacts in areas where resource endowments are poorest and the ability of farmers to respond and adapt is most limited (FAO, 2008).

Different authors explained that there has been change of grazing land into crop production as a result of population pressure causing decline in farm animal genetic resources (Solomon, 2013). There also has been paradigm shift of pastoral and agro-pastoral production towards crop production resulting in reduction of the livestock genetic resources at the expense of crop merit production systems (FAO, 2009).

2.5.3. People's Preferences and Attitudes

Different authors disclosed that animal genetic conservation based program should be based on broader breeding objectives that incorporate the needs, preferences and perceptions of the community(FAO,2010) and maintenance of the genetic diversity such as adaptation traits (DAGRIS,2007). Involvement in designing and implementation of the breeding program in line with principle of in situ conservation of animal genetic resources is one of the options which must be considered (FAO, 2009).

2.5.4. Market Conditions

References indicated that genetic diversity of AnGR allowed the sustained ability of a breed or population to respond to selection to increase productivity (CBD,2007) and for adaptation to changing environmental conditions, including not only those conditions associated with climate, but also to changes in markets, management and husbandry practices, and disease challenges (Jonathan,2010). Besides, developments in world trade, agricultural policies, consumption patterns, demands for cheaper food and increased productivity (Eric *et al*,2012;FAO,2008) and the availability, but sometimes inappropriate use of new reproduction technologies and selection tools, have favored the use of high yielding breeds and these breeds require high input and intensive care and management(Blackburn,2009).

However; the short-term economic benefits of replacing low yielding but well adapted breeds could be seriously challenged if the high yielding animals cannot withstand the climatic stress and lack the disease resistance needed for the new environments into which they are placed and this type of breed replacement, often caused by importing exotic breeds or practicing cross-breeding with exotic breeds without any long-term breeding plans, has contributed to severe genetic erosion, including extinction of a number of locally adapted breeds in the last few decades(FAO,2007;CBD,2007)

2.5.5. Climate Change and Variability

References indicated that the five main climate change related drivers could be mentioned as temperature, precipitation, sea level rise, the incidence of extreme weather events, and atmospheric carbon dioxide and other greenhouse gas content (CBD,2007) and climate change could be expected to affect livestock productivity directly by influencing the balance between heat dissipation and heat production (Claudia *et al,*2012) and indirectly through its effect on the availability of feed, fodder and water, as well as changes in disease challenge (FAO,2007) and to the most among other possible effects, climate change might significantly move livestock production away from current marginal rangelands, and could contribute to the shift in favors of intensive production systems () and could importantly affect the conservation of animal genetic resources as a consequence of extreme heat stress and other events(FAO,2010).

2.5.6. Biotechnology

Different sources showed that a series of developments in biotechnology could be expected to speed up as an on-going developments in the livestock sector with major impact on exchange, use and conservation of animal genetic resources and has also continued to progress in reproductive and cryopreservation technologies for all livestock species (Jonathan, 2010) and others also mentioned that development of a new generation of quantitative genetic tools, linking genomics (FAO, 2010)

Besides; quantitative genetics have improved efficiency and safety of transgenic and cloning technologies (CBD,2007) and to the most better control of animal diseases and increased availability of vaccines (Eric *et al*,2012) and to the last under animal biotechnology development scenario, superior genotypes could be distributed and used across the globe even more easily than today, which might have negatively affect conservation of global farm animal genetic diversity(FAO,2008;CBD,2007).

2.5.7. Diseases and disasters

References indicated that international trade and human travel has already led to the rapid spread and ultimately the globalization of diseases, resulting in a deterioration of the global animal health situation during 1980-2016 (FAO, 2010) and this situation could be expected to worsen. Diseases, natural disasters, civil war (CBD, 2007)) and other threats can have a serious impact on local animal genetic resources and thus might put impact on conservation of global farm animal genetic diversity as well (Jonathan, 2010).

2.5.8. Finance and Fund for farm animal conservation

Different sources indicate that More than 7500 different breeds of livestock have been recognized globally (FAO,2010) and conservation of all livestock breeds is considered to be financially infeasible (CBD,2007**)** and to the most a large proportion of global animal genetic resources have been found in developing countries (Blackburn,2009) and increasing productivity in the short term is often the main goal of breeding activities in such countries (Eric *et al*,2013) and in these countries merely a limited amount of funding would be available for conservation animal genetic resources in such conditions (Jonathan,2010).

However; industrialized countries have some control for companies involved in animal genetic resources conservation (Solomon,2010) and investment in long-term animal genetic resources conservation might not be considered as important financially as maximizing immediate genetic response (FAO,2007) especially when planning horizons have short (DAGRIS,2007) and competition among multiple countries (CBD,2007) and inclusion of government in animal genetic resources may affect the number of taxpayers and this has indicated the impact of finance and fund in animal genetic resources conservation (FAO,2008).

2.6. To review major mitigations and strategies of animal genetic resources conservation and development

2.6.1. Major potential mitigations relevant to the conservation and sustainable use of animals

2.6.1.1. Promote in situ conservation of local breeds

Reports indicated that conservation and sustainable use of AnGR is primarily a national responsibility, as specified by the CBD. National policies could include measures to promote in situ conservation and sustainable use of local AnGR, such as subsidies, breed improvement programmes, technical assistance, marketing support or re-stocking of local breeds (CBD,2007)). Moreover, they could also include policies on cross-breeding with exotics, and the stimulation and introduction of breed associations and herd books, or other forms of registration of animals and their pedigrees (FAO, 2007).

Breed improvement activities contribute to the maintenance of local breeds and range from national breeding programmes (run by institutions) to community-based, participatory methods (FAO, 2010.) where the conservation of local breeds could be supported by mechanisms to add value to such breeds and their products, the use of existing IPRs, such as geographic indications and trademarks, could be stimulated (Jonathan, 2010).

2.6.1.2. Raise awareness of farm animal conservation

References showed that an international commitment to conservation and sustainable use of AnGR can only be generated when awareness of the importance of this component of biodiversity is high (CBD, 2007). The incorporation of AnGR conservation and use issues into international processes in different forums (‘mainstreaming’) would have the benefit of increasing awareness among different stakeholders (FAO, 2010).

Similarly, generic arrangements are needed to help developing countries to build appropriate capacities to fulfill their tasks in terms of conservation and sustainable use (Jonathan, 2010). After more than a decade of the CBD being in force, implementation is still lagging behind. Given the countries’ obligations under the CBD and the priority that should be put on conservation approaches, the need to build such capacities at the national level is imperative from an AnGR perspective (Eric *et al*, 2012; FAO, 2007).

The increased awareness of the importance of genetic variability among livestock species, breeds and individuals within breeds as a potential for increased food and agricultural production, as demonstrated in many countries and breeds around the world, has led to several global initiatives to ensure the future availability of these resources(FAO,2010;CBD,2007).

2.6.1.2. Develop and implement ex situ conservation strategies

Ex situ conservation in particular requires long-term financial support. This also applies to in situ conservation when market or direct use value is low. On the one hand, regional and global cooperation may be needed to set conservation priorities, to share tasks, and to use existing knowledge and technical capacity efficiently (FAO, 2010; CBD, 2007).

On the other hand, measures at a regional or global level may be more complex than at a purely national level, possibly resulting in higher (transaction) costs. In many countries animal breeding laws have either only recently been developed or are currently in the process of being upgraded (FAO, 2007). Regional cooperation and possibly even global harmonization of breeding laws may reduce the risks of these institutions developing into trade barriers (DAGRIS, 2007).

3. CONCLUSION AND RECOMMENDATION

The global population is expected to increase from 6.2 billion to 9.2 billion in 2050 year (World Bank, 2008) and food production to support this population needs to increase by at least 60% while sustainably conserving the bio-diversity globally (FAO, 2010; IFAD, 2009) and developing countries to the most could be expected to account for 85% of the increased food demand from diversified agricultural sector and improvement of through introduction of technology such as improved breeds could be inevitable (FAO, 2007) and has also kicked off as early as 20^{th} century (FAO,2009).

There is an urgent need to increase efforts related to the conservation of AnGR, and the stimulation of their sustainable use. This includes issues related to access, benefit sharing and the demarcation of private, communal and national rights. Three important issues need to be discussed in international policy forums dealing with AnGR: How can we halt the further erosion of farm animal genetic diversity and promote their sustainable use? Is there a need to regulate the international exchange of AnGR? How to better balance different rights system and to improve equity between stakeholder groups?

A range of policies have impact on AnGR, including general biodiversity policies, but also notably policies on economic development, public and animal health, rural development, agriculture, environment and poverty reduction. Although many such policies do not specifically target AnGR, they nonetheless have a significant impact on the sector.

Similarly, in addition to specific policies and regulations for AnGR, policy changes in other areas may play an equal or even more important role. Awareness among policy makers and the general public regarding the threats to AnGR and their impact on sustainable agricultural production, as well as cultural identity and social development, is low. Awareness is also low among stakeholders in the animal breeding and livestock production sectors with regard to existing genetic resource policies. The low awareness and importance given to AnGR in general may thus be one of the reasons why there is so little attention given to the potential impact of many other policies on AnGR.

A global process or an international agreement on AnGR is likely to need to target i) more effective exchange of information and best practices on approaches to in situ and ex situ conservation; ii) the development of increased capacities (human and institutional) to support these initiatives; and iii) novel funding and facilitating mechanisms for the conservation of AnGR. While the costs of conservation are likely to be incurred locally, the future benefits may be national, regional or global. A similar differentiation arises from the fact that the costs of conservation are likely to fall on the public sector, whereas the economic benefits arising from AnGR often accrue to the private sector through, for example, the use of intellectual property rights.

Many domestic breeds of livestock are experiencing a gradual diminishment of genetic diversity; therefore, it is in the interest of the international community to conserve the livestock genetics. Although significant progress has been made in both semen and embryo cryopreservation of several domestic species, oocytes are extremely sensitive to chilling, and to date a standardized procedure has not been established. Long-term storage of oocytes would develop of ova banks, permitting female genetic material to be stored unfertilized until an appropriate male germplasm is selected. Successful cryopreservation of oocytes would also preserve the genetic material from unexpectedly dead animals and facilitate many assisted reproductive technologies.

From the term paper reviewed, it is therefore concluded that most of the diversified animal genetic resources are found in developing countries. Additionally; there are two methods of animal genetic resources conservation which are the in vivo and in vitro conservation methods and the in vivo approach is the most practical approach in developing countries though the in vitro conservation could be implemented as complementary to the in vivo as it has been found costly in developing countries. It is therefore recommended the national, regional and international governmental and non-governmental institutions to collaborate in conserving the animal genetic diversity in the world in general and the huge animal resources in developing country in particular as a whole.

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