

Dependences of livelihoods on animal genetic resource (AnGR)

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Abstract

Animal genetic resources (AnGR) encompass all the animal species, breeds and strains that are used now, as well as in the past and in the future - by humans for the purpose of food production and agriculture. Livestock play important roles in the production of food and for other purposes. The diversified use of livestock contributes valuable gross domestic product (GDP), critical to world food security in general and providing considerable global protein consumption. Significant percent of the world's rural poor depend on livestock for their livelihood. Livestock therefore are of great socio-economic and cultural value in various societies around the world. AnGR form the basis and the building blocks of the global livestock economy, a sector that is currently valued at income source, employs significant number of people and is essential to the livelihoods of poor small-scale livestock keepers. To utilize valuable resources from AnGR the potential of indigenous breeds in developing countries is often inadequately documented and utilized. Similarly there is a great challenge to alleviate poverty in developing countries by producing more and safe food, especially of animal origin, against a shrinking animal genetic diversity and increased global trade. Global initiatives must be locally internalized and accompanied by local activities to implement conservation programs that increase animal productivity while maintaining the necessary genetic diversity. Demonstrate effective breeding strategies (which take into account environmental, socio-economic and infrastructure constraints) must be developed. Research and capacity building at all levels to improve the knowledge of indigenous and alternative AnGR in different regions of the developing world is required. Summarizing and proposing initiatives for this situation and implications for the future use of AnGR is deed important.

1. Introduction

Starting from early years, people have been managing cattle, sheep, and goats. Overall, these animals were generally adapted to the local conditions (Taberlet, 2008). An estimated 1.96 billion people rely on livestock to supply part of, or all, their daily needs (EU/DFID/IUCN, 2001). Complex, diverse and risk-prone peasant livelihood systems need AnGR that are capable of performing the functions required of them in

these systems/AnGR that are flexible, resistant and diverse (Anderson, 2003). AnGR form the basis and the building blocks of the global livestock economy, a sector that is currently valued at USD 1.4 trillion, employs at least 1.3 billion people and is essential to the livelihoods of at least 600 million poor small-scale livestock keepers (Thornton 2010). The sector is critical to world food security, accounting for 40 percent of global agricultural GDP, providing 26 percent of global protein

consumption (Tekola 2013) and providing 17 percent to kilocalorie consumption. With an annual growth rate ranging between 3 and 5 percent, its significance is set to increase even further (Rosegrant et al. 2009).

Recognition is increasing of the importance to the poor of domestic animals as assets and livestock keeping as livelihood activities (EU/DFID/IUCN, 2001). Especially the poor that live in low potential and unfavorable agricultural areas depend directly upon genetic, species and ecosystem biodiversity for their livelihoods. In many regions animal genetic resources (AnGR) are a vital component of this biodiversity. The rural poor living complex, diverse and risk-prone peasant livelihood systems in marginal areas (core poverty), and the marginalized living from scarce resources in more favorable areas (peripheral poverty), need AnGR capable of performing the functions required of them in these livestock keeping systems*/AnGR that are flexible, resistant and diverse(Anderson, 2003). As (FAO, 1999; Anderson, 2003) report, the livelihood functions that livestock keeping fulfill include: cash income from sales of animals, their products and/ or their services; as buffer stocks when other activities do not provide the returns required; as means of saving, accumulating assets, insurance and providing co-lateral for loans; as inputs and services for crop production; to capture benefits from common property rights e.g. nutrients transfer through foraging on common land and manure used on private crop land; for transport, fuel, food, fiber for the household; and to fulfill the social and cultural functions through which livestock ownership provides status and identity(Anderson, 2003).

Nevertheless, major threat to the conservation and sustainable use of AnGR is posed by the continuing importation of

exotic breeds into developing countries, unraveling of traditional systems, lack of data and documentation of local production systems and breeds. Promotion of cross-breeding, current lack of industry interest in developing country genetics and difficulties of ex-situ conservation etc were also another bottlenecks. Different scholars and different stakeholder organizations like FAO (2007) recognized the genetic resources of animal species most critical to food security, sustainable livelihoods and human well-being are the result of both natural selection, and directed selection by smallholders, farmers, pastoralists and breeders, throughout the world, over generations. The result is a wide variety of livestock breeds that provide a diverse stream of benefits to the environment, humanity and its cultural heritage. But the historic and relevant contribution of all persons engaged in animal husbandry, who have moulded animal genetic resources to meet societal needs and their ownership and management of the genetic resources of their livestock that has enabled them to make important contributions in the past is not ensured for future societal benefits still especially in developing countries. Therefore, they should participate in the fair and equitable sharing of benefits arising from the utilization of animal genetic resources for food and agriculture and subject to national legislation, of respecting, preserving and maintaining traditional knowledge relevant to animal breeding and production as a contribution to sustainable livelihoods, and the need for the participation of all stakeholders in making decisions, at the national level, on matters related to the sustainable use animal genetic resources. Within this theoretical understanding the objective this review is: to review the dependence of livelihoods on the diversity of animal genetic resources, and review essentiality of the animal genetic resources

to satisfy basic human needs for food and a secure livelihood as well as livelihood sustainability.

2. Literature review

2.1. Human Economic

development is dependent on AnGR

As Richards et al. (2010) documented that an economically viable, environmentally sustainable, secure and safe agricultural system depends on the availability of a genetically diverse farm animal in assemblage with other biodiversity. Globally, domestic AnGR supply human requirements for food and agricultural production particularly vital to subsistence and economic development in developing countries. They provide year-round flow of essential products, sustain the employment and income of millions of people and contribute draught power and manure for crop production. In rural areas, livestock are an important source of food and cash, and hence are crucial for the purchase of consumer goods and procurement of farm inputs (Rege and Gibson, 2002). Profitability is vital to economic sustainability. To reach these potential, valued animal genetic resources, high animal health standards, excellent production systems, and fair market access will lend value to the production model. As improved incomes and urbanization shift diets towards high value commodities such as meat and milk, the contribution of livestock to economic growth increases through its multiplier effects with agriculture and other sectors outside agriculture (Swanepoel, 2010). Increasing economic growth, urbanization and population growth in many developing countries have led to a worldwide rush for a fast and large growth of livestock production (Gura, 2008). To meet their needs so that they “may continue to manage and improve

animal genetic resources, and benefit from economic development” is one of the aims of the FAO Global Plan of Action on Animal Genetic Resources supported by the FAO member governments. Many smallholders need to maintain and develop their breeds along their own breeding objectives and make their breeding decisions along criteria that relate to the local environmental, economic and social conditions, according to the Wilderswil Declaration made by civil society organizations in parallel to the Interlaken FAO Conference on Animal Genetic Resources (Gura, 2008).

2.2. AnGR as buffering and securing uncertainties’

Poor households are vulnerable to uncertain events. They often have insufficient resources to act as buffers during critical periods. Uncertainty arises in many different spheres. Natural hazards such as floods, droughts and pests may deplete harvests and ruin the local economy (Anderson, 2003). In addition to providing milk, meat, eggs, draught power, fiber, manure and fuel, livestock also serve as a ‘living bank’ for many small farmers, cushioning the risks associated with crop production and providing a financial reserve during periods of economic hardship (Perera, 2010). Livestock comprise one of the assets that make up a household’s asset portfolio. Households’ asset endowments are constantly changing, influenced by ‘external’ factors such as markets, government programs or natural disasters. Those with more assets tend to have a greater range of options and a buffer to secure their livelihoods (Anderson, 2003).

In livestock systems that are more marginal, the asset accumulation and insurance functions to hedge against risk and reduce vulnerability, are among the most crucial

functions of FAnGR (Rege *et al.* 2011). Livestock provides security to their owners against pests, diseases and unexpected climatic conditions (Shiferaw, 2006). One of the main reasons for animal domestication, early thousands of years ago, was to reduce the problem of unpredictability of food supply associated with unpredictable weather (Madsen, 2007).

The main function of backyard pig keeping was found to be as a convertible asset available and easily traded in order to make payments for health care, schooling, food and other household requirements (Anderson, 2003). Savings and risk management while livestock often provide their owners with a regular supply of products that can be consumed or sold to obtain cash income, for many livestock keepers' functions such as savings, insurance and the management of risk are extremely important (FAO, 2007).

2.3. Livelihoods adaptation mechanisms depends on AnGR

Domestic animal diversity provides farmers with the raw material to develop livestock that are more productive, more able to resist diseases or better adapted to the adverse conditions, which characterize many production environments (Shiferaw, 2006). Livestock breeds in the tropical parts of the world have during thousands of years become adapted to cope with harsh environments, including disease challenges (Thomton, 2007). Diverse animal genetic resources are crucial in adapting to changing socio-economic and environmental conditions, including mitigation strategies to climate change. They are essential for sustainable agricultural production in different countries (Richards *et al.* 2010). Much of the agricultural production involving livestock in the developing world occurs in high stress, low input-output production systems (Shiferaw, 2006). The

genetic diversity presently found in domestic animal breeds allows farmers to select stocks or develop new breeds in response to changes in the environment, threats of disease, new knowledge of human nutrition requirements, changing market conditions and societal needs, all of which are largely unpredictable (Shiferaw, 2006). Indigenous livestock breeds often possess valuable traits such as disease resistance, high fertility, good maternal qualities, unique product qualities, longevity and adaptation to harsh conditions and poor quality feed, all desirable qualities for low-input, sustainable agriculture (Shiferaw, 2006). Livestock are a crucial coping mechanism in variable environments, and as this variability increases they will become more important (Philipsson, 2011).

In these systems livestock genotypes have co-evolved with environmental circumstances over millennia and possess adaptive attributes such as disease resistance and ability to live and produce in such extreme environments with minimal feed and water. These locally-adapted indigenous livestock breeds play a major role in delivering the goods and services that make life possible for a large number of poor livestock keepers in these environments (Rege *et al.* 2011).

2.4. Livelihoods depend on AnGR to utilize environment and land resource

Some of the poorest people are found in parts of the world, where limited access to water, salinity of soils, difficult climatic and topographic conditions make vast areas unsuitable for crop production, and where improvement of productivity of the local vegetation is difficult (Madsen, 2007). Therefore, alternative value of such areas is therefore close to zero, and grazing of the natural vegetation represents the only way to

utilize such marginal areas for agricultural production. Goats can due to their agility and feed preferences (browsing) thrive and re-produce in areas, which are largely unsuitable for other livestock species (Madsen, 2007). Utilize marginal genetic diversity is more important in Africa where specific adaptive attributes of indigenous animal genetic resources are vital to the production systems that depend not on external inputs, but rather on the capacity of genetic resources to thrive under unfavorable environment, like the extremes of climate, disease challenge, and poor plane of nutrition(DAGRIS, 2004).

The 41 percent of the earth's land surface that forms tropical and subtropical dry lands, as well as mountainous and high-altitude zones and some very cold areas (CGRFA, 2009). In these eco-zones grazing converts the local vegetation into food and energy that can sustain people. Pastoralists and smallholder producers have developed an array of strategies for the sustainable use of these areas, such as sophisticated herd movements and grazing strategies. Ramsay *et al.* (2000) reported that Zulu sheep are tolerant to tick-borne diseases, internal parasites and have good walking and foraging ability. Such characteristics make them suitable for providing sustainable benefits to livelihood for rural farmers in Southern Africa (Oseni and Bebe, 2010).

2.5. Livelihoods social and Cultural life depend on AnGR

They provide to the livelihoods of the poor, livestock also have important social functions. So, those involved in assisting poverty stricken livestock-keepers need to understand and respect these traditions (FAO, 2007). Ownership of livestock may enable participation in the social and cultural life of the community, and the exchange of animals through gifts and loans can be a

means of reinforcing social networks that can be drawn upon in times of need (FAO, 2002; IFAD, 2004; Riethmuller, 2003).

The livestock social functions correspond to the symbolic values associated to each species and the use of animals for the fulfillment of a set of rituals and social obligations of families and communities (FAO, 2007). Livestock gives social status to its owners once it is considered a common mean of demonstrating wealth and provides economic status as it facilitates the access to informal credits and loans to the households. Livestock is also used in traditional rituals, ceremonies and festivities and is given as a gift in worships (e.g. installation of ancestral spirits, ritual slaughter, and bride wealth) (Maria *et al.*, 2013). There are often strong links between communities and their local breeds (FAO, 2007). In some countries or cultures, animals play an important leisure role, being used for betting, like horse racing and cock fighting, for sports, like horses in polo and bullfighting and for hunting, like dogs, falcons and horses (Maria *et al.*, 2013).

In the Southwest Pacific region, for example, the importance of pigs in social obligations and for consumption at the time of ceremonies and feasts is emphasized in the Country Reports (CR Palau, 2003; CR Samoa, 2003; CR Tonga, 2005; CR Tuvalu, 2004). The roles of livestock in religious and cultural life are highly varied, and it is only possible here to give some indication of the diversity mentioned in the Country Reports. In Guinea-Bissau, for example, small ruminants are important for feeding guests at events such as funerals, baptisms, birthdays, marriages and religious festivals (CR Guinea-Bissau, 2002).

Furthermore, cultural practices can also play a role in determining breeding objectives of livestock. For example, the Boran pastoralists prefer white coloured animals

(Nigatu and Getachew, 2002), while religious healers (*Shekas*) in Afar use white or black goats for sacrificial slaughter (Alemayehu Reda, 1993). Horses are also widely used for sporting purposes in the Europe and the Caucasus region. CR Ireland (2003), for example, mentions activities such as point-to-point racing, show jumping and eventing. Harness racing and trotting are popular in parts of Europe (CR Norway, 2003; CR Slovenia, 2003). On the island of Madura in Indonesia, for example, the local cattle breed is used for racing and dancing (CR Indonesia, 2003).

2.6. Poverty reduction and Human nutrition supported by AnGR

Without livestock revolution there is a great challenge to alleviate poverty in developing countries by producing more and safe food, especially of animal origin, against a shrinking animal genetic diversity and increased global trade (Philipsson, 2011). More than a billion people around the world live in extreme poverty, and the number is rising (Philipsson, 2011). There have been marked increases in hunger and as of 2009, the Food and Agriculture Organization of the United Nations (FAO) estimates that 1.02 billion people are undernourished (FAO, 2009). Availability of affordable food of livestock origin would contribute to alleviating this catastrophe (Philipsson, 2011). Other studies show that diversification of income sources through livestock farming can be a key strategy for escaping poverty (Kristjanson et al., 2004). Livestock provide a ready source of cash to meet expenses. For those households that are able to look beyond mere subsistence, expanding their livestock keeping activities and engaging in more market-oriented production is a potential pathway to increased income and improved livelihoods. Moreover, accumulating capital in the form of livestock may, in time, provide the

opportunity to embark on new livelihood activities (FAO, 2007).

Globally, the livestock sector accounts for 40 percent of agricultural gross domestic product (GDP) and livestock products provide one-third of humanity's protein intake. The demand for livestock products is expanding due to growing populations and incomes, along with changing food preferences (CGRFA, 2009). The multiple dimensions of poverty as described by the poor underscore the importance to them of livestock. Apart from producing several goods the livestock are also delivering many very important services considered to assist in alleviating poverty. Food insecurity is one of the dimensions of poverty and it encompasses food production, stability of supply and access to quality food (Madsen, 2007). Many development interventions aim at enhancing the income from livestock, such as through improved market access, development of value chains and intensification of livestock production (Herrero et al. 2010). There are concerns that the negative environmental impact of the livestock sector would aggravate with the forecasted increase in the demand for animal proteins in the developing world (FAO 2007; Tarawali *et al.* 2011).

2.7. Agricultural inputs, transport and fuel rely on AnGR

Crop production in the developing world highly depends on draught power provided by animals (FAO, 2007; Maria et al., 2013). Animal traction has traditionally been particularly important in Asia, and relatively unimportant in sub-Saharan Africa where its use has been restricted by heavy soils and the presence of tsetse flies (FAO, 2007). Livestock production is closely interrelated with crop production. The use of livestock and its sub product manure are important in crop production. Livestock is a source of energy providing draught animal power

while manure improves soil structure and fertility as well as water retention. Both uses are environmentally friendly improving energy and nutrient cycling. Livestock is also used to transport agricultural inputs and outputs and people (Maria et al., 2013). In the Gambia, for example, 73.4 percent of crop fields are cultivated using animal power (CR Gambia, 2003). In Latin America and the Caribbean, and in the near and Middle East, animal power is, again, vital to the livelihoods of many small-scale farmers. CR Ethiopia (2004), for example, notes that the uses of draught cattle, horses or donkeys include weeding, ploughing, threshing, and leveling fields before and after sowing. Among households that own draught animals, hiring them out is frequently a source of income. Where rural infrastructure is poor and the terrain is harsh, transport continues to be an important role of livestock. Ethiopia, for example, is a country with a large equine population. It is estimated that 75 percent of farms in the country are located more than a day and a half's walk from all-weather roads and animals are therefore vital for the transportation of farm produce to the market. A range of livestock species are utilized for draught purposes. In the related case of the Gambia, horses are the most significant species – being used to cultivate 36 percent of the cropland (CR Gambia, 2003).

2.8. Other livelihoods; Production of fiber, skins, hides and pelts

Human clothing, daily livelihood material and use of textiles and garments depends on livestock products such as fibers, hides, skins and hide are also important products. The Southwest Pacific is the region of the world that produces the most wool. In a number of countries, wool has traditionally been the most important product of the sheep sector – examples include Lesotho

and Uruguay (FAO, 2007). In the latter country, the wool industry has been a major source of employment, employing 14 percent of the labour force in manufacturing (CR Uruguay, 2003). Many sheep breeds have been developed for their wool. The fine-wool Merino breed from Spain has spread to all regions of the world; and in many countries there are indigenous breeds noted for the particular qualities of their wool. In India, for example, the Chokla and Pattanwadi sheep are known for producing good carpet wool, the Magra breed produces lustrous wool, and the Chanthangi breed is noted for fine wool (CR India, 2004).

The production of goat hair is concentrated in the Asia region, with significant production also in Europe and the Caucasus. Fiber from South American camelids is increasingly in demand in international markets because of its unique qualities, and also provides inputs to local craft production. Angora rabbits are another source of fine hair; China is by far the world's largest producer. The soft undercoat of Bactrian camels, in particular, is a source of fine fiber; China is again the main producer. Hair from the undercoat of yaks is become an increasingly important by-product in China where the textile industry has started to utilize yak fiber (FAO, 2003a). The coarse outer hair of yaks is used for a variety of purposes such as rope making. Among avian species, feathers may be an important by-product used industrially in the manufacture of bedding, or for small-scale handicrafts. Cattle hides and the skins of sheep and goats are produced in all regions of the world, while other products such as buffalo hides are more regional. Asia is the region that has the largest production of cattle hides and goatskins, while Europe and the Caucasus produces most sheepskins. Hides and skins provide raw materials to local leather and tanning industries, often at the artisanal scale. In a number of countries

they are also significant export products. At the subsistence level, skins are used in the production of clothing, rugs and other household items. In most cases, hides and skins are by-products of livestock production.

Conclusion

The information provided in the literature illustrates that the uses of AnGR are very diverse like poverty alleviation, improved food security and promoting sustainable agriculture etc in general. Many farmers rely on animals to provide inputs to crop production, and insurance and asset functions are of great importance where modern financial services are unavailable or unstable. Animal genetic resources (AnGR) functions their outputs or suit different way and at different rate depending on local community needs. But hindered by especially loss of livestock diversity seriously and lack of efforts. Similarly remains a large knowledge gap regarding the current roles of specific breeds, and whether they have characteristics that make them especially suited to particular functions or production conditions. People who depend upon – have to manage complex, risk-prone and diverse livelihood systems. The pressing concern at this point in time is necessary that these resources and their genetic diversity are gradually disappearing.

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