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The importance of livestock in societies

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Abstract

Every family needs to ensure that it has sufficient, nutritionally adequate and safe food for an active and healthy life throughout the year. This is one of the primary goals of every farming family, especially those whose only source of income is the family farm. The linkages between livestock keeping and human nutrition and health outcomes have been conceptualized. Broadly, they include positive effects of keeping livestock that generally improve a household's health and welfare status; and negative effects of livestock ownership that may worsen human health and nutritional status. The positive effects include increased access to nutritious animal source foods (ASFs), such as milk, meat, and eggs, in households owning animals, and higher household cash incomes that increase purchase power for ASF's, food crops, healthcare and education. Livestock is a hybrid of natural goodness and good farming practice. Local breeds are seen by their respective societies to symbolise traditional, local systems, and often environmentally friendly methods of production. As every day passes, the human population is increased, so there is a need for sustainable agriculture and livestock to fulfil the requirement according to global development.

Keywords: Family farm, animal source foods (ASFs), livestock, local breeds

Introduction

Livestock play multiple roles in the livelihoods of people in developing communities, especially the poor. They provide food and nutrition, work, economic and social status, and ensure environmental sustainability. With the livestock sector experiencing rapid change – mainly driven by the rapidly changing livestock production systems, demographics, environmental impacts, technologies, policies and institutions – this “multifunctionality of livestock” becomes an even more complex issue, intertwined with other research and development challenges. The contribution of livestock to the world's food supply, family nutrition, incomes, employment, soil fertility, livelihoods, transport and sustainable agricultural production continues to be a subject of significant review and debate (LID, 1999; ILRI, 2002; Ellis and Freeman, 2004; Kitalyi *et al.*, 2005; Chilonda and Otte, 2006; Thornton *et al.*, 2007; Perry and Sones, 2007 and Randolph *et al.*, 2007) [36, 30, 4, 33, 6, 59, 46, 50]. Furthermore, estimates show that globally, livestock provide animal traction to almost a quarter of the total area under crop production (Devendra, 2010) [14]. Livestock also provide a safety net in times of need in the form of liquid assets and a strategy of diversification for food production (Freeman *et al.*, 2007) [4]. All these reviews and studies thus far have shown that livestock play multiple roles in the livelihoods of people in developing communities, especially the poor.

And then, livelihood refers to capacities, assets (both material and social), and activities needed for people to make a living (Stroebe *et al.*, 2010) [57]. The range and combination of activities and the choices that people make to achieve their livelihood goals are called livelihood strategies (DFID, 1999 Ellis and Freeman, 2004) [23]. According to the Sustainable Livelihood Framework (SLF) devised by the British Department for International Development (DFID), livelihood assets and structural and institutional changes are two important factors influencing sustainable livelihoods (Chilonda and Otte, 2006, Peacock, 2005) [12, 47]. The influence assets might exert on choices of livelihoods strategies is often mediated by transforming structures and processes of institutional and organizational contexts that determine access to these livelihoods assets (Chilonda and Otte, 2006) [12]. Therefore, differences in the endowments of livelihood assets and capacity to access them in a specific institutional background determine households' choices of livelihood strategies.

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Owing to their lack of access to certain livelihood assets, asset-poor households are unable to take up economic activities with higher returns (Devendra, 2010) ^[14]. Given the importance of livelihood assets in determining livelihood strategy, SLF acts as a good tool for anti-poverty studies.

This paper presents an overview of the multifunctionality of livestock production in developing countries, focusing on some of the trends and driving forces of livestock production and their implications for developing communities. It also introduces research-for-development challenges of critical importance to livestock production in developing communities.

The role of livestock in enhancing and endangering human health

It is also important to mention that agricultural assets such as livestock influence the nutritional outcomes via the income pathway. However, in the presence of incomplete markets, the livestock play a direct role in nutrient intake and growth. The direct health benefits of livestock ownership prevail in the greater availability and consequently consumption of animal source foods. Such foods provide complete protein, energy and a wide variety of micronutrients, which are usually absent from the rural diets (Scrimshaw, 1994) ^[53]. Besides these essential nutrients, they also provide dietary diversity and curb the seasonal variations in food crop availability (Murphy and Allen, 2003; Wilson *et al.*, 2005) ^[42, 63]. Ownership of livestock also results in an enhanced household income that can be further used to purchase nutritious food items and better healthcare facilities, ultimately leading to an increased nutrient availability to the family members (Senauer, 1990) ^[55]. Similar findings were observed in our study as well but with specific reference to women workers.

In developing countries, human health is inextricably linked to the livestock. Livestock have an essential role in contributing to good health through providing animal source food, manure and draft power for plant source food, as well as income to buy food and health care. At the same time, livestock can lead to poor health if animal source foods contribute to poor diet and through providing a reservoir for diseases infectious to people. The poorer quality of diets in developing countries is reflected by the low average levels of supply (and consumption per head) of meat and dairy products. Livestock have considerable potential to contribute towards improving food and nutritional security, enhancing agricultural growth, reducing rural poverty and mitigating farm households' vulnerability to production shocks (Ashley *et al.*, 1999, Pica-Ciamarra, 2005, Akter *et al.*, 2008) ^[8, 49, 5].

Livestock can impact a household's nutritional status via the family member who controls the income generated from livestock activities. And they are a source of protein-rich food, income, and status for poor livestock keepers, and they enrich crop production through animal traction and manure. In (livestock) development, there is a wide array of views on the best way to achieve a positive outcome, in terms of food security, income generation, employment and (environmental) sustainability. In this way, animals optimize the efficiency of the farm as a whole, in terms of soil fertility, energy efficiency and minerals such as nitrogen and phosphorus. This is increasingly perceived as an option for food security and poverty alleviation, as well as climate

change adaptation and mitigation. Livestock also contribute indirectly to food security by increasing crop output through providing manure, which is a valuable source of organic plant nutrients and reduces the need for chemical fertilizers. Livestock enhance the flexibility and thus the stability of food production (Akter *et al.*, 2008) ^[5]. Because they can be kept for variable lengths of time and be maintained on a variety of diets they serve as a buffer to mitigate the impact of fluctuations in crop production on the availability of food for human consumption.

A number of studies show positive nutritional benefits of livestock ownership for children. Neumann *et al.* (2002) have highlighted the role of ASF in enhancing the diets of women and children due to the availability of certain forms of micronutrients in them. Hitchings (1982, cited by Smith *et al.*, 2003) ^[54] found a positive relationship between child height and ownership of a milk cow, conditional on milk being used for family consumption. Smith *et al.*, (2003) ^[54] provide evidence that the nutritional status of preschool children in the households participating in a dairy development project in Kenya, was better than that of children from non-participating households. Biomedical evidence has validated that the consumption of dairy products has a strong marginal effect on child nutrition. These effects are particularly stronger for children between 6 and 24 months of age who are no longer exclusively breastfed and have high physical growth potential (Senauer, 1990) ^[55].

Diversification into livestock, and increasing livestock productivity should form part of strategies for poverty reduction and agricultural productivity growth in developing countries, because a large share of the rural poor keep livestock as contributors to their livelihoods (FAO, 2009; LID, 1999; Thornton *et al.*, 2002) ^[36] and because livestock have a variety of characteristics that make them important contributors to sustainable rural development. Livestock provide high-quality food and marketable products that can be produced by small-scale farmers and are generally of higher value and less vulnerable to climatic shocks and critical harvest timing than many crops. Livestock also increase crop production, by providing draught power and manure; enhance labour productivity, by reducing drudgery and dependency on hand-tools, thereby freeing time for other production activities; and smooth labour demand across agricultural seasons. One of their most important roles is converting organic material not suited for human nutrition into high-value food and non-food products. Finally, livestock – especially small stock such as poultry, pigs, sheep and goats – are particularly important assets for rural women, whose role in agriculture is often unappreciated. From livestock, women can earn income that remains under their control, with implications for the intra-household allocation of food and resources. However, the unregulated growth of livestock populations may generate negative externalities: increased production of greenhouse gases (GHGs); pollution of soils and water sources from animal wastes; increased human health risks; and deforestation and unsustainable use of land resources for feed grain production.

In marginal areas with harsh environments, livestock provide a means of reducing the risks associated with crop failure and a diversification strategy for resource poor small scale farmers and their communities. It is very important to note that animal source foods are dense and palatable

sources of energy and high-quality protein, important for vulnerable groups, such as infants, children, pregnant and nursing women and people living with human immunodeficiency virus with high nutritional needs. They also provide a variety of essential micronutrients, some of which, such as vitamin A, vitamin B12, riboflavin, calcium, iron, zinc and various essential fatty acids, are difficult to obtain in adequate amounts from plant-based foods alone (Murphy and Allen, 2003) ^[42]. Animal source foods provide multiple micronutrients simultaneously, which can be important in diets that are lacking in more than one nutrient: for example, vitamin A and riboflavin are both needed for iron mobilisation and haemoglobin synthesis, and supplementation with iron alone may not successfully treat anaemia if these other nutrients are deficient (Smith *et al.*, 2003) ^[54]. Micronutrients in animal source foods are also often more readily absorbed and bioavailable than those in plant-based foods (Murphy and Allen, 2003) ^[42].

The sustainability of nutrient use in global livestock supply chains

The management of nutrients in agricultural systems has contributed to a tremendous growth of plant and livestock production (Galloway *et al.*, 2003, Steinfeld *et al.*, 2006) ^[24, 56]. With the future increase of world population, livestock production will continue to play a key role in sustaining food production, and economic growth (Alexandratos and Bruinsma, 2012) ^[5]. Growth in the global animal inventory quickly translates into a need to manage manures and waste waters. In some settings, managing these materials is simple, and in fact integral, to the ongoing sustainability of agriculture. Many farms in the world effectively use manures as the only source of nutrients for plant growth, either because of the lack of availability of inorganic fertilizers or because of a desire to farm organically. As described by Cavalett, and Ortega (2009) ^[10] a sustainable agricultural production system would not only meet production goals, but also would ensure that environmental quality is maintained or improved and that the social expectations of the community at large are achieved.

The management of nutrient flows is central to agriculture and food supply chains. It has driven the development of agricultural practices since their origins: flood control, crop rotation, manure recycling and crop residues management are examples of techniques aimed at harnessing nutrients and maintaining them in agricultural systems. Animals have always played an important role in agricultural nutrient cycles, whether we think about their capacity to 'harvest' nutrients in natural rangelands, or about intensive systems where they are fed nutrient dense rations specifically cropped for this purpose. As a consequence, improved efficiency is increasingly proposed as the panacea to environmental sustainability, possibly overlooking some of its limitations. In this context, also a fundamental re-evaluation of national and international nutrient management policies for intensive animal production is needed. The guiding principle for these policies should be nutrient balance, at all spatial scales. Farms producing animals should first and foremost have the land base, or access to sufficient land, to recycle manure nutrients in accordance with codes of good agricultural practice, including those that address environmental protection and natural resource conservation.

Indeed, animals raised under the extensive production systems must satisfy their nutritional needs through the

existing vegetation. But animal's welfare must be prioritised because when the availability of nutrients is below the animal's needs, body reserves will be used in an attempt by the animal to maintain quasi-normal body function. Malnutrition, and the associated lack of nutrients essential for the integrity of cells, can cause impairment of the immune system which can increase the risk of infectious diseases, resulting in an inflammatory response with associated pain and suffering (i.e. poor welfare). Thus, animals need the proper nutrition for growth and maintenance, and to provide energy for work and vital functions. Proper nutrition is also needed to maintain body temperature, produce milk, reproduce, and develop proper bone structures. Without proper nutrition, animals can develop health problems, which could result in treatment costs or even fatality. Good nutrition is essential for all of the systems of an animal to function and work together properly. As result this situation will extremely impact on foods consumed by costumers.

In this section it also important to note that mixed farming systems are found to be more efficient compared to specialised crop or livestock production systems. Land is more intensively utilised as population density increases, and crop-livestock interactions intensify. The crop-livestock system has the advantages of allowing diversification of risks, using labour more efficiently, recycling wastes thus preventing nutrient losses, adding value to crops and crop products while providing cash for purchasing farm inputs. This system is responsive to market development. When there is access to dynamic urban markets, there is positive intensification and diversification of production. Farmers become integrated into the market economy, specialising and allowing them to take advantage of economies of scale.

Promoting Local Breeds through Marketing of their Products

Marketing is an important aspect of any livestock system. It provides the mechanism whereby producers exchange their livestock and livestock products for cash. The cash is used for acquiring goods and services which they do not produce themselves, in order to satisfy a variety of needs ranging from food items, clothing, medication and schooling to the purchase of breeding stock and other production inputs and supplies. Nowadays, marketing is an issue that is relatively less important to low-input and diversified livestock keepers than to the more cash-oriented, more specialized livestock keepers. However, the improvement of people's livelihoods will be very dependent on a system of markets where they can bring their animals and the products thereof to sell and buy. This can include both formal and informal marketing, and make use of different forms of monetary and non-monetary exchange. The marketing of produce by breed societies to the public marks a significant step. Societies are attempting to increase knowledge of their animals to a wider public network of people. In this way, cultural and social capital develops amongst retailers and members of the public, thus increasing the economic worth and capital of particular breeds (Mendelsohn, 2003) ^[40].

Breed societies have been crucial in the enrolment of livestock and people into farming networks and the development of farming habitus. Their main role has been to formalise the ideas and social networks associated with the breeding of farm animals. Farming may be viewed as a site of social struggle in which contention is the ubiquitous

feature of collective life (Zander *et al.*, 2013) ^[64]. Different breed societies engage in tournaments of taste (Hernández-Morcillo *et al.*, 2013) ^[29] with each other to establish and promote the commercial use of different breeds in farming practice. This can lead to internal political conflict within breed societies to determine how best to do this (Steinfeld *et al.*, 2006) ^[56], but, as this section demonstrates, the results of these tournaments are manifest more clearly in the promotion and changing geographies of different livestock breeds.

Consumers who live and work away from agriculture often develop specific desires for types and quality of agriculture products. This presents an optimum opportunity to construct specific market commodities for these consumer demands. Animal breeds were originally selected according to their functions, and only those that adapted best to the environment, husbandry conditions, and the demands of their holders survived (Mendelsohn, 2003) ^[40]. Breeding for valuable traits, such as the ability to adjust to steep slopes, narrow trails, scree, snow, ice, relatively high ultraviolet radiation, and low food availability, led to a high diversity of domestic animal breeds in the Alps (Mendelsohn, 2003) ^[40]. However, today's livestock production has changed from a resource-driven activity bound to local conditions and environments to one driven by demand, which is typically separate from local geographical or other constraints (Steinfeld *et al.*, 2006) ^[56]. Consequently, highly specialized traits in domestic animal breeds often became obsolete in emerging, high-input-based farming systems (Hernández-Morcillo *et al.*, 2013) ^[29], leading to a progressive replacement of traditional multipurpose breeds with high-yielding breeds (Ugarte *et al.*, 2001, Zander *et al.*, 2013) ^[60, 64] and more profit-oriented farming.

Livestock provides lot of products and by products but meat and milk are two major products in livestock category. To produce economics of scale in livestock production, it is necessary subsidized input resources for livestock and technological change is required in feed production. The marketing of livestock products are as important as production because while analysing the infrastructure of developing countries the products are not completely marketed as compared to developed countries. Mostly, livestock is operated by public organization but in recent years private organizations are investing in this sector due to which new machines and equipments are introduced. These reforms will change the production process and proper marketing channels will be formulated (Ugarte *et al.*, 2001) ^[60].

The idea behind labelling products and creating niche markets is to raise the value of local products and support sustainable, regional, small-scale production systems (Zander *et al.*, 2013) ^[64]. Keeping indigenous livestock breeds in today's economy is usually less lucrative than keeping high-yielding breeds, and is therefore more expensive for farmers (Ugarte, *et al.* 2001) ^[60]. However, value can be added to products from traditional farming systems through increased traceability and market transparency. Such products also provide socially and psychologically rooted benefits for the consumer (Zander *et al.*, 2013) ^[64]. Therefore, economic losses to farmers can be balanced by a higher value to consumers. This conservation strategy could establish a new place for indigenous breeds in modern agriculture. In addition, consumers' increasing demand for superior quality food and regional products

indicates that there are open markets for such products (Blasco, 2008).

The Social and Cultural Value of Local Livestock Breeds

There is currently a wide consensus concerning the conservation of animal genetic resources by maintaining a certain variation of local breeds within their production systems (Gandini and Oldenbroek 1999) ^[25]. One of the strongest motives for the conservation of farm animal genetic resources is to meet future market demands and as an insurance against future changes in production circumstances (FAO 1998). Breed preservation is important from a socio-economic and ecological point of view, as the farming of many local breeds supports local economies in marginal areas (Maijala *et al.* 1984) ^[37] and contributes to the appropriate management of semi-natural habitats of conservation value (Ostermann 1998) ^[44]. The need for the preservation of local breeds has also been linked to their cultural value (Matassino and Cappuccio 1998) ^[38], as they reflect a long history of symbiosis with mankind.

The erosion of farm animal diversity is a widespread phenomenon and the economic resources to intervene in at risk situations are often lacking. It is therefore necessary to determine which breeds should be saved and to have access to tools for the assessment of the conservation meaning of the individual cases. Managing animal genetic resources is a complex task because it is necessary to deal both with questions specific to the resources (such as selection, or the conservation of breeds) and with cross-sectorial matters affecting animal genetic resources, such as animal health measures, development and trade standards, and environmental management. In order to appreciate the role that traditional communities can play in conservation and management of animal genetic resources, it is important to understand the sociocultural underpinnings of breed development. Social institutions and cultural traditions provide the context that determines the animal management choices available to farmers. Indeed, social and cultural forces are often the most important factors in diversifying livestock (and livestock production systems) and in developing breeds.

Furthermore, local breeds have often been a key factor in the evolution of specific cultural landscapes (Marshall, 1992) ^[39] – a local livestock breed can also, in principle, be considered cultural property, especially in relation to its role as a historical witness. Agricultural production and pasture management (Palang and Fry 2003) ^[45], building techniques used for animal shelters and animal fodder storage facilities have had a clear role in the development of agricultural landscapes, which are the expression of man's relationship to nature, historically stratified and in constant evolution, and today thought to be one of Europe's treasures that must be preserved. Many European countries are developing national strategies for the conservation of their farm animal diversity. International organizations, such as the European Union, the Nordic Council of Ministers, the FAO and the European Association for Animal Production, have committed themselves to develop co-ordination and financing plans to promote awareness and the farming of local breeds.

Environmental Considerations: Land-use changes due to increased livestock demand

The impact of humans on the global environment is unprecedented (Vitousek *et al.*, 1997; Foley *et al.*, 2005; Lambin *et al.*, 2001) [61, 22, 34]. Global climate change, deforestation, dwindling water resources, desertification and loss of biodiversity are all symptoms of human-accelerated environmental change. These impacts stem from human population growth, and the rapidly expanding level of per-capita consumption (Myers and Kent, 2004) [41]. While population growth rates in developed countries are generally declining, they continue to grow at rapid rates in many developing countries such as in Latin America, India and South East Asia (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2007). Growth in per-capita consumption since the 1980s is prevalent in developed countries and increasingly so through the emergence of 'new consumers', estimated at over one billion people, in the affluent middle class of rapidly developing regions such as China, India and Latin America. The demand of these new consumers for motor vehicles, energy, household goods and meat-rich diets is increasing the pressures on ecosystems around the globe (Myers and Kent, 2004) [41]. The challenge of the 21st century is for socio-economic systems, including consumption behaviours of both developed and new consumer societies, to become more sustainable in response to potentially catastrophic global environmental change.

The process of deforestation and agricultural expansion into the forested ecosystems has characteristically led to landscapes almost devoid of the natural forest vegetation, generally with less than 10% of the original cover (Etter *et al.*, 2006) [16], with resulting high impacts on biodiversity (Costa *et al.* 2003) [13]. Generally speaking, of course, increased livestock production has a number of potential negative environmental consequences. Among these, the conversion of land from natural habitats to agricultural uses more generally – particularly in tropical forest areas – has been a key cause for concern for the past few decades. Land use conversion from forest to pasture is driven by incentives for livestock production (which are increased by livestock demand), limited alternatives to livestock production in these areas, and perhaps more importantly, economic inequality and poverty that create incentives for forest clearing by migrants. Clearing forest land reduces biodiversity and ecosystem services (e.g., pollination, pest control, flood control and water release).

The livestock sector increasingly competes for scarce resources, such as land, water, and energy, and has a severe impact on air, water and soil quality because of its emissions. According to the Food and Agriculture Organization, for example, the world's livestock sector is responsible for 18% of the global emission of greenhouse gases. This contribution of 18% was explained by emission of carbon dioxide from fossil-fuel combustion and deforestation, emission of methane from manure and enteric fermentation by ruminants, and emission of nitrous oxide from application of fertilizer during cultivation (Steinfeld *et al.*, 2006) [56]. Even though, population growth has long been identified as a fundamental determinant of landscape change by increasing the demand for land and resources (Lambin *et al.*, 2003, Millennium Ecosystem Assessment Board, 2005) [35]. However, Fensham and Fairfax, (2003) [20] opined that international demand for agricultural

commodities had a far more important impact on landscape change than internal population growth, as producers cash in on demand, although paradoxically, declining returns from agriculture also tend to increase land clearance as landholders try to maintain their incomes.

In addition to changes in production practices, eating less or no livestock products, such as meat, is seen often as a possible solution to reduce the environmental impact of the livestock sector (Carlsson-Kanyama, 1998, Pimentel and Pimentel, 2003, Reijnders and Soret, 2003, Baroni *et al.*, 2007) [11, 48, 5, 9]. Indeed, a balanced plant-based diet can provide us with all the nutrients required for a healthy life (Appleby *et al.*, 1999) [1]. Eating meat, however, is not only a reflection of nutritional needs, but it is also determined by taste, odour, and texture, as well as by geographical area, culture, ethics and wealth (Richardson *et al.*, 1993) [52]. In member countries of the Organization for Economic Cooperation and Development (OECD), more than one-quarter of the energy content of an average diet still consists of animal products (FAOSTAT, 2009) [19]. A massive number of people in developing countries, moreover, are turning to this kind of diet (FAO, 2002) [17].

Managing sustainable landscapes

The idea of sustainable landscapes might be in contradiction to a basic definition of landscape. Landscapes evolve continuously in a more or less chaotic way and reflect social and economic needs of a particular society at a given moment. The concept of landscape encompasses more than an area of land with a certain use or function. I consider landscape as a synthetic and integrating concept that refers both to a material-physical reality, originating from a continuous dynamic interaction between natural processes and human activity, and to the immaterial existential values and symbols of which the landscape is the signifier. The interaction between nature and culture is considered as an essential characteristic of landscapes (Naveh, 1995; Antrop, 1997, 2000; Palang and Fry, 2003) [43, 2, 45] and forms an important property of sustainability in traditional agricultural landscapes (Austad, 2000; Goudie, 2000; Haines-Young, 2000; Grove and Rackham, 2001) [7, 26, 28, 27]. Change is an essential character of landscapes (Antrop, 2003) [4].

Consecutive generations lived and worked in the same landscape and tried to improve and preserve it. Valuing the land and sustainable development were inherent to this kind of development, which is also referred to as involution (Klijn and Vos, 2000) [7, 32]. Many places or elements in the landscape received a symbolic value. Also the concept of genius loci is closely associated with the identity of each landscape and emphasizes its uniqueness. I call this type of landscape a traditional one (Antrop, 1997) [2]. It contains the complex history of a place or region, which still can be read from its composition and structure. In Europe, with its long and complex history and great cultural diversity, a rich variety of traditional landscapes emerged, which form an integral part of our cultural heritage. Here, landscape and soil are important and unique sources of essential knowledge. The main threats for these are land development and intensive agriculture.

The significantly used landscape of human livelihoods still exhibits very major net losses of forest (Palang and Fry, 2003) [45]. Haines-Young (2000) [28] proposed the concept of natural capital as a new paradigm for landscape ecology, in

particular when applying landscape ecological principles in sustainable development and landscape management. Vanishing traditional rural landscapes can be sustained with different objectives, such as preserving ecological functioning and diversity, continuing or reintroducing traditional practices that proved to be sustainable, maintaining and enhancing the quality of life for the local population to prevent land abandonment. In areas of increasingly intensive land use and concentration of people and activities, new landscapes must be designed to fit the multifunctional use of space in a more sustainable manner. In this vein, understanding landscapes from a purely ecological perspective also is well advanced with assessments having focussed on issues such as ecological functioning of landscapes. This might be helpful to project multifunctional landscapes.

Rethinking the management of urban spaces to enable multifunctional landscapes is becoming a priority across different sectors. The emergent research area of sustainable multifunctional landscapes provides just such a focus. Sustainable multifunctional landscapes are landscapes created and managed to integrate human production and landscape use into the ecological fabric of a landscape maintaining critical ecosystem function, service flows and biodiversity retention. This is essential if we are to halt and reverse declining trends in the majority of our ecosystem services. Furthermore we need landscapes that assist species in responding to increasing climate pressures, facilitating movement and establishing in new emerging ecosystems. Only by doing this we will be able to maintain some degree of ecosystem service provision into the future. And transdisciplinary practice in this theme is also considered essential for achieving multifunctional landscapes because the integration of formal and informal knowledge achieved in the process generates a holistic perspective of the urban landscape, resulting in more satisfied citizens and a well-functioning natural environment.

Economics of Livestock-keeping Systems and Livestock production

Livestock production is undertaken in a multitude of ways across the planet, providing a large variety of goods and services, and using different animal species and different sets of resources, in a wide spectrum of agro-ecological and socio-economic conditions. Within this wide variety of livestock production there are certain patterns that have been categorised into various livestock production systems. Most frequently, these systems have been defined on the basis of land use by livestock, and for this purpose the distinction between grazing systems, mixed farming systems and industrial (or landless) systems has been widely accepted. A combination of the different systems is often found within one household or farm, e.g. when an intensive dairy cattle farmer also keeps chickens and pigs on a low-input basis or when a smallholder farmer keeps sheep on a semi-pastoralist basis. Meanwhile, in most developing countries, the high-input specialized systems are growing in size and numbers, with large-scale animal farming especially around urban centres.

In order for decision-makers to address the livestock related food safety challenges in global markets, it may be useful to look at livestock production systems as the basic building blocks of the sector. Livestock production is undergoing

rapid change, and this change manifests itself in the growing contribution that livestock makes to satisfying increasing global demands for high-value food products, and in continuous adjustments at the level of resource-use intensity, size of operations, product orientation and marketing channels. In many of these systems, the livestock element is interwoven with crop production, as in the rice/buffalo or cereal/cattle systems of Asia. Animal manure is often essential for maintaining soil fertility, and the role of animals in nutrient cycling is often an important motivation for keeping animals, particularly where this involves a transfer of nutrients from common property resources to private land. In addition, rationally managed livestock systems could play a positive role in rural livelihoods as they constitute a source of protein food with reduced costs, nutrient recycling, increased savings, availability of draught force, and a diversified source of commercial products.

Sustainable growth in a livestock production system was not given proper attention (e.g Marshall, 1992 and Kaasschieter *et al.*, 1992) ^[39]. The social and environmental issues related to sustainable livestock production provide assistance in developing a system with accomplish the human consumption and social needs (Thompson *et al.*, 1999) ^[58]. Sustainable development basically gives stress to ecological limits but it now includes socioeconomic and cultural dimensions as defined by Food and Agriculture Organization (FAO, 1992): "Sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable." Separately, Brundtland Report (WCED, 1987, p.43) ^[62] defined sustainable development as "A development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: one is the concept of need and other is the idea of limitations imposed by the state of technology and social organization". The key issues discussed for sustainable development means that need for the product should be given more superiority as compared with other needs and environmental ability to attain that product should not damage other things or concentrate on that product only.

Conclusion

The livestock species play very important economic, social and cultural roles or functions for rural households once they contribute to improve income and wellbeing of the farm family. Livestock helps on food supply, family nutrition, family income, asset savings, soil productivity, livelihoods, transport, agricultural traction, agricultural diversification and sustainable agricultural production, family and community employment, ritual purposes and social status. However, under the increasing population growth, shortage of agriculture land and increasing demand for livestock has created a pressure for formulating better agricultural resource management policies. The erosion of farm animal diversity is a widespread phenomenon and the economic resources to intervene in at risk situations are

often lacking. It is therefore necessary to determine which breeds should be saved and to have access to tools for the assessment of the conservation meaning of the individual cases. As a result, the importance of maintaining certain breeds should become big attention for farms.

Livestock have some unique characteristics which make them a desirable component of the strategies targeting women empowerment and children's welfare. Livestock can be easily acquired with a small initial investment and being a reproductive asset these can be multiplied to accumulate wealth and savings. They also generate a range of products and services, almost on a continuous basis, and the earnings from their sales can be utilized to meet households' daily consumption needs and other expenditures. However, more sustainable in response to potentially catastrophic global environmental change due over livestock demand should be considered. Beside this, local breeds can actively contribute to maintaining cultural diversity which is necessary for the evolution of culture and of mankind. The social role of the local breeds should be acknowledged as part of their cultural value. Without local breeds and the traditional farming methods used in rearing them, many cultural aspects would disappear and we would lose an immensely valuable part of our history and tradition, as well as the opportunity of rendering marginal lands economically viable.

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