

Managing marginal lands: Including pastoralists in chains and networks

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Abstract: Demand for food of animal origin is increasing as a result of population growth, urbanization, and income growth in developing countries and this demand will continue to grow in the years ahead. To meet this demand it will be necessary to use supply chains, in addition to traditional supply chains, from marginal lands utilized by pastoralists. Despite of its potential as supply system for food, pastoralism was not only poorly understood but also viewed differently by different people on its sustainability as a viable livelihood system. To this end, this paper reviews, two paradigm views: equilibrium and disequilibrium on the sustainability of pastoralism. The authors rather propose a punctuated equilibrium as an alternative view not only to explain the dynamic pattern of the pastoral system but also to incorporate the resilience concept for learning and adaptive capacity of pastoralists, from marketing perspective, for sustainability as food suppliers. In this regard, this paper argues that by enhancing adaptive capacity and resilience through learning, knowledge and marketing capabilities, pastoral livelihood can be a viable and sustainable food supply system. For necessary learning and knowledge flows, however, pastoral systems need be effectively aligned with the chains and networks of the external market. Hence, chain and network theories may help to understand adaptability of pastoralist system to the world demand for meat by providing information and market knowledge.

Keywords: Food, pastoralism, chains and networks, paradigms, learning and knowledge

1. General introduction

A revolution is taking place in global agriculture with its profound implications for human health, livelihoods, and the environment (Delgado et al., 1999). One facet of this revolution is an increase in demand for food of animal origin as a result of population growth, urbanization, and income growth in developing countries (Delgado et al., 1999; Van der Zijpp, 1999; Rae, 2001). At the same time, rising consumer incomes coupled with their changing lifestyles are creating bigger markets for high-value agricultural products like meat (Von Braun, 2005). The growing markets for these products present an opportunity for developing-country farmers to diversify their production and raise their incomes (Von Braun, 2005) as well as challenges (e.g. standards, quality and safety) to export their products to satisfy the demand. The projected demand for food of animal origin is also considerably higher in the years ahead (Table 1). If such growing demand can not be met, it will negatively affect food security, the basis of human welfare and economic and political stability (Van der Zijpp, 1999). Therefore all feasible supply potentials should be solicited to satisfy this growing demand for meat of animal origin to maintain a balance in the global demand and supply equations.

Table 1. Food consumption of meat in kg per capita, carcass weight equivalent

Region	1964/66	1974/76	1984/86	1994/96	1997/99	2015	2030
World	24.2	27.4	30.7	34.6	36.4	41.3	45.3
Developing countries	10.2	11.4	15.5	22.7	25.5	31.6	36.7
Sub-Saharan Africa	9.9	9.6	10.2	9.3	9.4	10.9	13.4
Near East/North Africa	11.9	13.8	20.4	19.7	21.2	28.6	35.0
L.America & The Caribbean	31.7	35.6	39.7	50.1	53.8	65.3	76.6
South Asia	3.9	3.9	4.4	5.4	5.3	7.6	11.7
East Asia	8.7	10.0	16.9	31.7	37.7	50.0	58.5
Industrial countries	61.5	73.5	80.7	86.2	88.2	95.7	100.1

Source: FAO (2003)

Currently, there are many different types of supply chains that contribute to the catering of the demand for meat in both the developed as well as the developing world. Many of the traditional supply chains, particularly in developing countries, are based on the distribution of ready to eat meat products where there exist few large scale meat production facilities for possible value adding activities. At the same time, these supply chains carry meat of animal origin which is produced by intensive production, either through livestock/mixed cropping or commercial farming systems. But with the growing consumer concern on ecological and environmental issues these traditional meat supply chains may not be appropriate to supply meat of animal origin which is produced by using natural pastures. On the other hand, pastoral systems are able to utilize ecological niches of production of high value protein unavailable to other farming systems (Koocheki & Gliessman, 2005). In this respect, we see a pastoral system as a differentiated alternative supply chain that can satisfy a particular demand of high quality food even though the system is poorly understood and under pressure.

Pastoralism can be defined as a system of production devoted to gaining a livelihood from the care of large herds of animals and is an adaptation to a particular habitat: semi-arid open country or grasslands, in which cultivation apparently cannot be sustained (Cohen quoted in Smith, 1992). It represents a particular optional strategy for exploiting areas that are too marginal for alternative uses; examples are: plains, deserts, steppes, mountains and tundra (Galaty & Johnston, 1990). Pastoralist refers to the people who live mainly on herds of domesticated animals using primarily natural pastures (Koocheki & Gliessman, 2005).

Pastoralists are usually distinguished from cattle farmers by many features (Bostedt, 2005). Notably; *Natural Pastures*; which implies that pastoralists usually have access to free and natural grazing resources. *Subsistence*; which indicates that pastoralists raise their animals both for direct consumption as well as for exchange value, although the level of interaction with the market economy varies. *Peripherally located*; pastoralists lack advanced infrastructure and logistics more than other systems because of their remote locations. *Marginal environment*; they utilize optimally a limited natural resource in a marginal environment where large scale sedentary production is difficult and unsustainable.

Despite its contribution to satisfy the growing demand for meat of animal origin, pastoralism is currently a livelihood system that in many parts of the world is under ecological, socioeconomic, or political pressure (Mabbutt, 1981; Fratkin, 1997; Abule et al., 2005). The system is still largely misunderstood. As a result much of the literature concerning pastoralism focused on the so-called failure of the pastoral economy and hence, desertification and degradation became commonplace terms in the discussion of pastoralism as food production system (Adriansen, 2006). However, despite of all challenges and conceptions, pastoralism still represents a particular food production pathway where more diverse economic activities are pursued in most parts of the world (Galaty & Johnston, 1990). Today, pastoralism is perceived to be an ecologically rational livelihood, and the best way to utilize dry lands (Andriansen, 2006). In the future pastoral economy is going to thrive as a result of increased industrialization and demand for food in the cities which accordingly will lead to an intensification and commercialization of the pastoral production (Swift quoted in Andriansen, 2006).

This paper argues on pastoralism as a viable marketing system to fulfill the growing demand for food of animal origin in many parts of the world. Specifically, we argue that pastoral livelihood can be a potential sustainable food supply system by enhancing its adaptive capacity and resilience through learning and developing pastoral marketing capabilities. However, for pastoralism to play its role as a sustainable marketing system it is crucial to develop marketing skills and knowledge to its sustainability as part of the global meat supply for food. In this paper we will propose pastoralism as an important supply system for the world's needs for food of animal origin, define its specific features and identify its specific challenges in fulfilling that role. The paper also reveals lack of emphasis on the role of external market learning and adaptation perspective to pastoral competitiveness and sustainability by two dominant paradigm views on pastoral livelihood. Since the role of pastoralism as potential food supplier has been underestimated by the existing paradigms we argue that taking the punctuated equilibrium view can provide a more appropriate perspective on the role of market learning and adaptive capacity for pastoral sustainability as viable food supply system.

2. Pastoralism as a livelihood system

Pastoralism is based on the use of natural pasture and is practiced in dry environments where rainfall is generally unreliable for sustainable crop-based livelihoods (Berhanu et al., 2007). As a distinctive form of human subsistence economy (Hudson and Hudson, 1980; Galaty and Johnston, 1990), pastoralism always tended to be a more mobile way of life (Christian, 2000) than agriculture since feeding large herds of livestock requires moving them from pasture to pasture in a year (Christian, 2000). Through mobility pastoralists can exploit patchy resources in a more flexible and more effective way than can sedentary population (Koocheki & Gliessman, 2005). The mobility of pastoralists not only makes them to be specialists in complex systems of land use (Change and Tourtellotte, 1993), but also ensures pastoralists' contacts and exchanges of ideas, technologies, goods, and customs (Christian, 2000). And hence, pastoralists' flexibility is often the key to their survival (Hudson and Hudson, 1980; Blench, 2001).

By exploiting the marginal lands pastoral animal production provides people with food (milk, meat, and blood), manure (for fuel and fertilizer), wool, hides, draft power, transportation, added security, and the possibility to accumulate capital (Berhanu et al., 2007). It also contributes to domestic and global markets (Hatfield and Davies, 2006). The value of pastoralism is not confined to that which can be captured in the market place (Hatfield and Davies, 2006). It also creates and maintains ecosystem health and stability, and as such it is responsible for a range of environmental goods and services such as ecotourism and biodiversity (Hatfield and Davies, 2006).

Pastoral people have long subsisted through the exploitation of domestic livestock, and is being practised today largely in areas of Africa, the Middle East, Central Asia, Mongolia, highland Tibet, the Andes, and Arctic Scandinavia and Siberia (Fratkin, 1997) where crop cultivation is marginal because of climatic conditions (Hudson and Hudson, 1980). Despite of the fact that pastoralism is a sustainable mode of resource extraction in dryland areas (Koocheki & Gliessman, 2005), the system was not given due attention for its importance as a livelihood that could contribute to the food supply in a sustainable way. The system was rather viewed differently by different people regarding its role in the world and its sustainability as a food supply.

2.1. Paradigms of pastoral livelihood

There have been concerns about the sustainability of pastoral systems of the world since the last century (Vetter, 2005). These concerns were mixed with both pessimistic and optimistic views regarding the sustainability of the pastoral livelihood. These views on rangeland ecology and pastoral sustainability can be grouped among the two blocks of paradigms: the old equilibrium view versus the new disequilibrium view. Analysis of these paradigms for pastoral livelihood could be important since they affect the mind set of long term flexibility and adaptive learning in the system (Price quoted in Sammut-Bonnici and Wensley, 2002).

a) The old ecological paradigm (equilibrium range view)

In the 1970s and 1980s, pastoralist research was dominated by the cultural ecology framework of adaptation to understand how pastoralists responded to drought and environmental change (Fratkin, 1997). This view is referred by names such as; "ecological paradigm", "old paradigm", and "tragedy of the commons paradigm". Ideas of equilibriums between plants and herbivores around predictable stable states and hence, the 'balance of nature' with emphasis on biotic relationships (e.g; livestock density on vegetation composition, cover and productivity) was the

dominant paradigm (Boon and Wang, 2007; Wessels et al., 2007). This view emphasized the role of grazing and rangeland management in determining community composition and suggested that overgrazing could lead to rangelands degradation (Wessels et al. 2007); and as such it asserted the imminent collapse of the traditional pastoral food production system (Warren, 1995). Ecological paradigm with “the tragedy of the commons”¹ view maintained that common property resources shared by pastoralists led to overgrazing and environmental degradation (Fratkin, 1997) that could jeopardized the collective good (Waren, 1995). According to this view pastoralists are preoccupied with the goal of maximizing animal biomass and hence lack motivation or strategy to preserve their own habitats in the long term (Lamprey quoted in Coughenour et al. 1985). As a result, pastoralists living in and exploiting arid areas were seen as disturbances in the system rather than as a long-term part of the same larger ecosystem (Little in: Coughenour et al. 1985) and should be excluded from grazing their livestock in shared ecosystems (Fratkin, 1997). Pastoral practices including the tendency of individual herders to maximize their herds, coupled with growing populations of both herders and their animals, were viewed as promoting desertification (Fratkin, 1997).

Using the prescriptions of this view, policies of international donor communities such as the World Bank, and the Food and Agricultural Organization emphasized privatization of the range, commercial ranching, and sedentarization of nomads, particularly in Africa (Fratkin, 1997). The preparation and implementation of projects aimed at increasing pastoral productivity (measured in terms of off take of beef for export and urban domestic consumption), retarding or reversing some claimed environmental degradation, and improving producer income and enhancing the quality of pastoral life (Horowitz, 1984). Improving livestock productivity by limiting the size of herds on rangeland was thought to be achieved best by increased livestock marketing, using Western models of individual commercial ranches (Horowitz, 1984). Respective governments, too, re-enforced the paradigm in their pastoral communities by translating it into range management policy (Waren, 1995) where the bottom line range managers were required to adjust grazing level to maintain animal populations near the calculated stable state of the range model (Boon and Wang, 2007).

But, these livestock sector development efforts almost never resulted in sustainable increases in production, improvements in the environment, or bettering of the socioeconomic conditions of pastoral producers (Horowitz, 1984). The approach of this view failed because it inhibit pastoral flexibility and mobility that is essential to their survival and failed to make use of traditional land management expertise (Bisson, 1993). The equilibrium view, and its solutions in terms of range management, animal husbandry, and marketing strategy, were often inappropriate (Scoones, 2004).

b) New paradigm (Dis-equilibrium view)

In contrast to the equilibrium view, non-equilibrium view maintains that pastoral systems are driven primarily by stochastic abiotic factors (e.g; variable rainfall) which result in highly variable and unpredictable primary production (Vetter, 2005; Wessels et al., 2007). It holds that as a result of the variable climate, the range land systems are inherently dynamic that do not reach long-term equilibria (Warren, 1995; Wessels et al., 2007). Since seasonal and longer-term

¹ Commonly held view from the Hardin’s 1968 thesis (quoted in: Fratkin,1997) where pasture will be overexploited by maximizing the herd size and finally resulting both into degradation and disruption to livestock production.

drought controls the growth of the herd (Boon and Wang, 2007), there is no causal relation between pastoral biology and environmental degradation (Coughenour et al. 1985). Consequently, the productivity of pastoral system is very rarely affected by grazing and rangeland management and hence livestock numbers can be increased without threatening degradation (Scoones, 1994; Vetter, 2005).

The new thinking takes pastoralism in its more holistic livelihood terms with important local understandings as to how to respond to uncertainty (Spoones, 2004). It views pastoralists as ecologically rational (Adriansen, 2005) and more successful than ranchers which severely subvert the hypothesis of the tragedy of the commons (Warren, 1995). Traditional pastoralists have developed a system for exploiting natural pastures efficiently by using mobility and herd movement as their primary management tool (Galaty & Johnston, 1990). They are innovative and rational managers who aim to maximize the 'human support capacity' of their resource base (Davies and Bennett, 2007). Pastoral patterns, like mobility, are cornerstones of stability and sustainable productivity rather than causes for degradation (Coughenour et al. 1985).

Under the non-equilibrium thinking, dry land pastoralists are viewed as elaborate institutions (Horowitz, 1984) that are capable of responding to fluctuating resources with cultural behaviors that include flexibility, mobility, and diversity of species (Coughenour et al. 1985). To this end, informal institutions are available with their highest roles in buffering resource variation in rangelands by facilitating resource reciprocity in various common-property pastoral systems (McCallister et al., 2006). It views pastoral institutions and systems as dynamic and emergent from adaptive practices and flexibility full of learning, negotiation and adaptation. But, the adaptive nature of the system withheld by this view is mainly from cultural and social perspectives and hence still lacks the external market economic learning perspective. However, from the context of the two views for pastoral sustainability, the emerging non-equilibrium model emphasizes the need for participatory approach to local institutions and knowledge to make use of traditional land management expertise for increased food production.

c) Punctuated equilibrium (As an alternative view)

Despite of the tremendous debates as to the nature and approach to pastoral sustainability between the equilibrium and the disequilibrium views, emphasis on the role of external links and networks to markets for pastoral sustainability were not explicitly emphasized. More of the debates in these two paradigms focus on whether pastoral production system will prevail or perish. Little has been said from an evolutionary perspective to focus on pastoral livelihood system as an adaptive and learning institution from the external networks and market interactions for its sustainability. But, to sustain this livelihood for food production integration of ecological management with economic and social aspects need be understood (Koocheki & Gliessman, 2005).

In this paper we would like to view the pastoral system neither simply as "equilibrium" nor as "dis-equilibrium" but rather more of characterized as punctuated equilibrium. Because pastoralism has often been punctuated by forays into agriculture, wage labor and other activities to diversify and persist itself as a production strategy over time (Fernandez-Gimenez & Le Febre, 2006). Besides, the punctuated equilibrium views systems as self-organizing entities that evolve through learning (Sammut-Bonnici and Wensley, 2002). And as such, the theory is linked to processes of organizational learning that accounted for tensions between the forces for

stability and change that generate revolutionary transformations (Romanelli and Tushman, 1994). Approaching from the punctuated equilibrium view can also give us a broader lens to this production system to look from the resilience theory that helps to incorporate the learning and adaptive capabilities for pastoral sustainability. Our approach is also consistent with recent studies which suggest that most pastoral systems encompass elements of both equilibrium and non-equilibrium at different scales (e.g; Vetter, 2005). And hence we propose that the pastoral system as food supply chain has to be understood from the punctuated equilibrium perspective where the system's existence has been dominated by its sorting mechanism of different adaptive responses and resilience to: climatic, socio-cultural and economic factors. Taking the punctuated equilibrium view gives a wider perspective on the adaptive capacity of the pastoral supply system to external market and the role of market chains as sources of knowledge which were ignored by previous paradigms.

Punctuated equilibrium view of transformation has become important theoretical model to study and analyze change in organizations (Sammut-Bonnici and Wensley, 2002). According to Romanelli and Tushman (1994) punctuated equilibrium theory depicts organizations or (systems) as evolving through relatively long periods of stability (equilibrium periods) in their basic patterns of activity that are punctuated by relatively short bursts of fundamental change (revolutionary periods). It describes a view of evolution where there are extended phases of consistency intermittently disrupted by short surges of new life forms (Sammut-Bonnici and Wensley, 2002). In a wider context, organizations demonstrate traits of punctuated equilibrium in the development of strategy, capability, processes and the production (Gersynk quoted in Sammut-Bonnici and Wensley, 2002). This could also mean that pastoralists, given market linkages and alignments, can exercise adaptation processes in value adding strategies and capabilities to stay fine tuned to the external chains and networks.

Because of their flexibility, adaptability and dynamism pastoralists are remarkably resilient in coping with all but the most severe natural calamities (Mortimore, 2003). Since resilience perspective is one of the sorting mechanisms of punctuated equilibrium (Van Den Bergh and Gowdy, 2000), viewing and analyzing the pastoral systems from resilience perspective gives a wider scope to focus on the system's innovative capacity, learning and adaptation for sustainable food supply. Hence, extending the concept of punctuated equilibrium view can give us a broader perspective to assess the adaptive capacity of the pastoralists to learn for building their knowledge and marketing capabilities required as sustainable marketing system for food supply. Given that mobile pastoralism is vital for rangeland ecosystem health and sustainability (Hatfield & Davies, 2006), empowering the system with marketing skills and knowledge to enhance the added value to supply food for larger global consumers can give more leverage to sustain the system's Triple P objectives: improved livelihood for pastoralists (people), food supply for global consumers (profit) and the environmental health (Planet).

3. Pastoralism as a marketing system

Since marketing is an important aspect of any livestock system (Bekure and Tilahun, 1983), most pastoralists also supply their livestock to markets at both international, national and local level (Hatfield and Davies, 2006). Marketing is so essential to pastoralists not only as a mechanism whereby pastoralists exchange their livestock and livestock products for cash (Bekure and Tilahun, 1983) but also it facilitates destocking of animals during drought (Turner and Williams, 2002; Barrett et al., 2004). But, the extent to which pastoral livestock are being marketed depends on the availability and access to markets (Barton et al, 2001).

3.1. Unique features of pastoral marketing system

Pastoral marketing system varies in a number of ways than other marketing systems and traditional supply chains. Most importantly: 1) Exchange process is secondary since production is usually subsistence aimed at producing foods for household members (Fratkin et al., 1994), 2) direct marketing of live livestock rather than slaughtered animals 3) the product (livestock) is moving from place to place as a result of pastoral mobility, 4) marketing information asymmetry because of less formalised marketing information systems, 5) marketing activity closely aligned with personal benefits of the pastoralists (products stay with pastoralists until the moment of marketing exchange), 6) products (livestock) have some unique features as commodities in such a way that they are individually identifiable and are living animals which hold greater cultural and social meaning than other major commodities (Turner and Williams, 2002). These features could have a number of marketing implications to align and effectively integrate the pastoral economy into the broader global exchange system. The level of alignment and integration in turn is highly conditioned by lack of marketing skills in the pastoral areas (Berhanu et al., 2007) which eventually undermined the competitive advantage of pastoralists at the global livestock marketing chain (Hatfield & Davies, 2006).

When direct marketing and processing can be carried out effectively, pastoralists can fill specialized market niches (Hatfield and Davies, 2006) that may not be served by other systems. The importance of this marketing system may continue given the growth in global demand for livestock products fuelled by higher disposable incomes (the so-called livestock revolution), combined with the “communications revolution” (Hatfield and Davies, 2006). But, despite of the growing pastoral links to the global economy (McAllister, 2006), many pastoralists still face constraints in realizing the economic potential of their system owing to high transaction costs, such as distances to processing plants, absence of formal markets, poor access to information and fair contracts (Hatfield and Davies, 2006). Because of these, pastoralists are currently producing what they like to produce and hence product is just a commodity. On the other hand, because of safety concerns, the global market is considering food products (including livestock) as differentiated; hence there exists marketing mis-match on the demand and supply side. As a result, further change is inevitable (McAllister, 2006) to pastoralism as a marketing system by aligning itself to the wider global consumer concerns and preferences. Reliable alignments and partnerships among pastoralists and chain actors could promote a more sustainable livestock supply over long term (Desta et al. 2006).

If the system cannot adapt and align itself with the growing global food chains and networks, then further marginalization because of less competitiveness may prevail which eventually threatens the pastoral marketing system as food supplier. Since pastoralism to have a place in the future depends in large part on markets (Fernandez-Gimenez and Le Febre, 2006), they must be linked

to the marketing chains in new and efficient ways to capture a fair share in the value chain for food (Von Braun, 2005). To attain the latter, however, they need be equipped with adaptive capacity in marketing skills and knowledge to align them with the global food markets for sustainability. In this regard, chain and network theory can be employed to facilitate learning processes about realignment problems (of pastoralists) in global supply chains (Le Heron et al, 2001) which may open up many new opportunities for gaining and sustaining a competitive advantage (De Man, 2005).

3.2. Chains and networks in pastoral marketing system

Currently, the force of globalization is driving firms towards new forms of co-operation in chains and networks (Omta et al., 2002). However, the major challenge in this changing environment to pastoralists and other rural producers is gaining and understanding of knowledge that underpin the evolving global food supply chain (Le Heron R. et al, 2001). And hence, the extent to which knowledge flows within the livestock marketing chain is highly imperative to bring positive market oriented change to the pastoral marketing system (Humphrey and Memedovic, 2006). Since value chain systems refer not only to the networks of the materials flow but also to the networks of the knowledge flow (Choi et al. 2001), networks bound together by reciprocal, trust based linkages could facilitate joint learning and knowledge transfer while permitting easy adaptation to changing conditions (Murdoch, 2000) to pastoralists.

In this regard, knowledge flows and participant alignment are important in the supply chain for sustainable performance (Le Heron et al. 2001) of the pastoral systems. Since supply network is a complex adaptive system with its emerging, self-organizing, dynamic and evolving characteristics, any change in this adaptive system would trigger changes in other adaptive systems and hence eventually the collective environment changes (Choi et al. 2001). As a result, improvements in organizational performance (e.g; on farm level) are achievable through participants creating and using knowledge to realign their activities and practices (Le Heron et al. 2001). Accordingly, pastoralists need be equipped with the role to learn about the marketing dynamics in food chains.

The significance of learning and knowledge to pastoralists is highly underlined in the current competitive environment where marketing activity by itself is also being viewed as a continuous learning process where skills and knowledge are becoming fundamental unit of exchange and source of competitive advantage (Lusch and Vargo, 2006). In this line, if pastoralists are equipped with market knowledge and information they can be special marketing systems to cater organic food supply to global consumers. By enhancing knowledge and marketing skills of pastoralists, many of their current constraints in realizing the economic potential of the system could be minimized. Hence, pastoralists demand information flows, knowledge flows and others from the network theory. If the network theory and chain system is internalized among the pastoralists they can also exercise marketing plans not only to match their product with the requirements of the market but also to destock preemptively during drought or other climatic changes to minimize livestock losses.

The broader importance of network approach to pastoralists can be highlighted more by considering the six principal benefits of networking, including knowledge flows, (Pittaway et al. 2004). These are:

1) *Risk sharing*; pastoralists market actors are characterized for their engagement in livestock market without prior knowledge of prevailing prices and supply conditions (Mahamoud, 2006). As a result marketing takes place primarily through spot negotiation between producers who walk their animals in to the town and traders who collect the animals for onward transportation (Green et al. 2006) without prior arrangement in price, quality and quantity of the livestock and hence could be potentially risky exchange. However, by forming networks of long term relationships, the risks related to: price variability, livestock quantity, quality, and safety or health can be shared and minimized. Through information flows and cooperative actions from the networks, pastoralists can also integrate their marketing mix elements (product, price, place and promotion) in order to minimize the impact of risk.

2) *Obtaining access to new markets and technologies*: Downstream chain actors are usually near to the consumers (market). Markets that require certain standards and high demand for special ecological products could be more accessed by pastoralists through networks. Through supply chains and networks rural (pastoral) producers can access market information and knowledge to enhance their value added activities (Van der Meer in: Mercurius, 2002). Hence, by networking themselves pastoralists can have access to new markets and ideas.

3) *Speeding products to market*: Currently, pastoralists lack adequate information regarding market requirements. Information flow through networks on livestock characteristics that could impact price in the market can help pastoralists to better define marketing strategies (Radeny et al. 2006) to facilitate their livestock to markets.

4) *Pooling complementary skills*: Through network interaction and communication pastoralists can gain complementary skills that could be important to their production and marketing strategies. For example; skills on estimating the live weight of livestock to be sold is important for pre-estimating the price that can be fetched in the market (Adugna, 2006).

5) *Safeguarding property rights*: formation of networks based on trust and mutual commitment between chain actors and pastoralists can help to safeguard in the event when complete or contingent contracts are not possible. In the absence of contracts and legal protections confidence is required to avoid default and deception (Zaal et al. 2006); and

6) *Acting as a key vehicle for obtaining access to external knowledge*: since the networked economy is not merely a transaction based economy but a knowledge sharing community (Venkatesh et al. in: Lusch and Vargo, 2006) aligning pastoralists to the chains and networks can help them transform toward a learning system (Folke et al. 2005). For peripheral areas, like pastoral regions which are distant from the core of knowledge economy, facilitating interactive learning through external networking could help nurture innovation (Virkkala, 2007). With the knowledge flows through chains and networks the pastoral system can adapt and evolve and hence can be resilient and flexible for sustainability.

Besides the above benefits, environmental sustainability can also be achieved by collaboration of firms throughout the chain and network from consumer to producer and the introduction of sustainable food production systems (Trienekens and Willems in: Mercurius, 2002). Since the sustainability of the pastoral system with the Triple P (Profit, People and Planet) objectives largely depends on markets, integrating them to markets requires market knowledge and marketing capabilities. Therefore, for aligning pastoral marketing system to the growing food chains and networks, knowledge flows from the chain and networks are highly imperative.

4. Conclusion

The ever growing demand for food of animal origin requires looking for more food supply chains in addition to the existing ones. In this regard pastoral system can be indispensable marketing system to supply ecological friendly product to the global niche market. But for pastoralism to be a sustainable and dynamic marketing system for food supply, the issue of learning, knowledge and information flow to enhance its adaptive capacity need be taken into account. In this perspective, the pastoral system may be more viewed from the punctuated equilibrium point to emphasise its adaptive capacity and resilience for learning and marketing capability building. If the system is more linked to, and aligned with, the growing food supply chains and networks; knowledge and information flow from external market could make the system more adaptive to exercise its value adding activities for sustainability. Hence, emphasis for pastoral food supply system's sustainability from the supply chain and network alignment point of view and the necessary knowledge flow is highly crucial. Access to knowledge for value adding potential therefore requires participating in global food chains and networks and hence key challenge from future research and policy perspective will be to identify ways in which pastoralism can both enter these chains and participate in ways which lead to its sustainability. This may require joint action of pastoralists, public-private partnerships to empower groups of pastoralists with skills and knowledge of working with chains and networks to: produce, brand cooperatively and deliver competitive products in both national and international markets.

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