

REVIEW PAPER

Pastoralists and Their Means of Livelihood: A ReviewAkshita Chadda¹

1. Ph D. Scholar,
Department of Veterinary &
Animal Husbandry Extension
Education,
College of Veterinary Sciences,
Guru Angad Dev Veterinary &
Animal Sciences University,
Ludhiana, Punjab, India
Corresponding author e-mail:
akshitachadda098@gmail.com

ABSTRACT

Mobile pastoralist groups are often underrepresented by existing models of progress: their representation in political processes is negligible, and their movement is perceived by the governed as a problem rather than as a viable means of subsistence. The natural resources used by pastoralists are under strain due to the overexploitation of the grazing pastures that have been spared from encroachment into arable land due to population expansion and the rising demand for meat. More stress is placed on the system by varying environmental circumstances, such as persistent droughts. Environmental deterioration, dwindling natural resources, modernization, and liberalization all put strain on pastoralists' means of subsistence. These dynamics constantly make poverty and socioeconomic marginalization among pastoralists harder rather than better, but they also encourage participation in educational opportunities that could raise their future social standing, increase job security, and improve future sustainable livelihoods. With so many issues at play, it's critical to examine whether pastoralism can be viewed as a sustainable production system or whether the pastoralist production system is inherently incapable of dealing with today's issues in the sense that it is harmful to the world's finite resources. This review paper describes the current situation of pastoralists, the Ethno veterinary practices they employ to care for their animals, and the issues they encounter. Strengthening pastoralist's ability to diversify their sources of income requires educating them about entrepreneurship, teaching them how to pool resources to finance their business ventures, and ensuring that they have access to credit and markets.

Key words: Pastoralism; Ethno veterinary practices; Livestock; Challenges.

Pastoralism is a domain with a very uneven global literature that is influenced by political and security concerns as well as the demand for factual facts. The anthropological literature and development reports that have been reviewed reflect that pastoralists are a segment of Indian society that has received significantly less attention than other social groupings from both a research and development perspective. Geographically speaking, the Deccan Plateau, the Thar Desert, and the mountainous parts of North India (Himalayas) are where nomadic pastoralism is most common. Pastoralism is an animal husbandry method that involves moving livestock along a predetermined grazing path at various spatiotemporal scales. It involves raising various cattle breeds while maintaining suitable mobility patterns in a range of ecological settings, from dry, desert rangelands to steep alpine grasslands (FAO, 2021). There is a great deal

of variability in pastoralism since it entails migratory livestock rearing systems that varies depending on socioecological configurations. Cattle, buffaloes, camels, sheep, goats, donkeys, yaks, and even ducks are raised using transhumant methods as part of mobile pastoral systems. This profession provides a living for approximately 500 million individuals globally (Manzano et al. 2021). A significant population of 13 million in India, however, rely on traditional pastoral activities to generate a livelihood (Kishore and Köhler-Rollefson, 2020). Besides providing various unquantified financial gains like manures, transportation, employment, and environmental services, pastoralism also gives employment, revenue, and control over the national territory in addition to certain direct and indirect benefits like the selling of milk, fur, meat, and hides. Pastoralism in India is rarely investigated and documented. In comparison to other

regions in the world, it has a different structure and social structure. Most pastoral groups have only been briefly discussed in some of the biggest communities in Western India, such as the Bharwad, Rebari/Raika, and some Himalayan areas like the Gaddis, Kinnauras and Gujjars. Statistics on the population are scarce or negligible. Pastoralists have proven to be incredibly resilient; they maintain healthy social hierarchies and methods for resource sharing, and their livestock additionally acts as a liquidity. The environment has been changing over the past few decades because of natural and anthropogenic activities; this environment change causes a spectrum of ailments and primarily affects the health of marginal populations, such as pastoral nomads who depend on traditional economic activities, live in a remote area, and have limited access to health services (IPCC, 2014). Indian pastoralists face a number of difficulties as a consequence of the deteriorated and reduced pastures in their homelands as well as the scarce feed and fodder resources along their migratory routes (Meena et al. 2021^a). The vast amount of indigenous knowledge held by pastoralists has gone unrecognized, and they are seen as being behind the times (Sharma et al. 2003). As the preservation of biodiversity is receiving more attention on a global scale, pastoralists potentially earn recognition for their contribution in preserving cattle genetic diversity, important indigenous breeds, and native coping skills strategies for responding to environmental stress factors like floods and droughts.

Concept of pastoralism : Pastoralism is a sort of animal husbandry in which domestic animals, also referred to as livestock, are allowed across vast areas of naturally grown land (pastures) for grazing. Pastoralists primarily rely on three resources: livestock, pasture, and water, and they migrate for these reasons in order to maintain the ecological balance of nature (Meena et al. 2019). Historically, this practice was practiced by nomads who travelled with their herds. Cattle, camels, goats, yaks, llamas, reindeer, horses, and sheep are among the various animal species engaged (Schoof and Luick, 2018). Pastoralists can be described as the individuals of ethnic groupings with a strong historical connection to livestock-keeping, where a considerable portion of the population derives higher than 50.00 per cent of household income from the sale of livestock products, where more than 90.00 per cent of animal consumption comes from pastures or browse, and where household members are in responsible for the

entire livestock breeding cycle. The pastoral system is a specialized method of managing natural resources and demonstrates a well-developed symbiotic interaction between the local ecology, domesticated animals, and people in resource-limited, climatically marginal, and frequently unstable situations.

There are more than 200 pastoral communities in India, which constitutes nearly 13.00 million Indian population (Meena et al. 2019; Rollefson and Kishore, 2021).

The following are the most well-known pastoralist communities in India:

| Pastoral Groups | Location & Species |
|-----------------|--|
| Bakarwals | Kashmir (Mainly goats) |
| Bhotias | Upper regions of Garhwal & Kumaon of Uttarakhand (Sheep, Goats, Cattle) |
| Bhuttias | North district of Sikkim |
| Bharwad | Gujrat |
| Changpas | South-East Ladakh (Yak) |
| Dhangars | Maharashtra (Mainly cattle) |
| Gaddis | Kangra and Dharamshala regions of Himachal Pradesh, parts of UP and Punjab (Sheep and Goats) |
| Gollas | Karnataka and Andhra Pradesh (Mainly cattle) |
| Gujjars | Jammu, Himachal Pradesh & Uttarakhand (Mainly buffaloes) |
| Kinnauras | Kinnaur district of Himachal Pradesh |
| Monpa | Arunachal Pradesh (Yak) |
| Raikas | Rajasthan (Sheep, goats and camel) |
| Toda | Tamil Nadu, Karnataka, and Kerala (Mainly buffaloes) |

Source: Singh, K.S. (1996) and Meena et al. (2020^c).

Pastoralist's innately resilient way of life : Over ancient times, pastoral communities all over the world have evolved unique strategies for adapting to the widely different geologic, climatic, and biotic situations of grasslands regions (Shaoliang and Sharma, 2009). A traditional strategy used by herders to deal with fluctuations in the supply of water and pasture available at various locations and times due to climatic variability is mobile livestock grazing. It is widely believed that pastoral practices have consistently developed ways to deal with growing restrictions as well as new and dangerous obstacles (Kreutzmann, 2013). The production techniques employed by pastoralists also appear to be extremely resistant to unfavourable conditions. According to various research studies, pastoralists are thought to

be the leading authorities on maximising the use of grasslands (UNOCHA, 2007).

Indigenous technical knowledge (ITK) system : Since pastoralists do not have a substantial amount of land to cultivate fodder crops, they often migrate pastorally to other locations in order to procure fodder for their animals and majority of them treat their animals as per traditional approaches (Meena et al. 2021^b). In rural and pastoral regions, where half of the world's livestock population is concentrated, health is a key barrier to livestock growth and production. The majority of these communities are located in remote places where endemic infections, illnesses, and parasites are prevalent. Even though there are significant issues with animal health, these locations lack easy access to contemporary veterinarian information and services, and the population is less well-off financially. The people's own indigenous, generations wisdom that has endured through the ages in all facets of human evolutionary life is the sole basis for the coping mechanisms and methods (Ahmad et al. 2016). Due to their migratory lifestyle and inadequate access for scientific veterinary services, the pastoralists rely on ethno-veterinary techniques for the handling of the prevalent health issues of their animals (Muricho et al. 2018; Onono et al. 2019; Meena et al. 2020^a). To manage the natural resources in the pastureland, the pastoralists relies on their native knowledge and extensive experience. Pastoral communities need to learn about better animal husbandry techniques and should take part in various training programmes on scientific animal husbandry. To enhance the adoption of better practises, an all-encompassing extension strategy must be employed (Meena et al. 2022).

Problems faced by pastoralists : The nomadic way of life has been stereotyped as being less civilized, less fruitful, and more threatening than a stable way of life (Saberwal, 1999). The hard and constantly fluctuating ecological conditions present in pastoral areas, nomads have always been obligated to deal with unpredictability. The pastoral community which has a large population of animals, faces numerous difficulties in daily life as a consequence of environmental factors that must be addressed with the proper approaches. Issues such as inequality in access to resources and services, marginalization in politics, socioeconomics, and culture, unexpected climatic shifts have long had an impact on pastoralism (Jenet et al. 2016). Even though pastoralism is indeed a significant part of the

local economy, government policies have neglected it in favour of modernising the area by introducing agriculture, which is thought to be the greatest strategy to promote development and reduce poverty (Mohammed, 2010). Additionally, the process of marginalisation at the cultural and policy levels has severely deterred the next generation from adopting pastoralism as a profession. In order to maintain their way of life, pastoralists might have been obliged to explore for alternate sources of revenue, due to an unexpected yet temporary period of famine and a poor market network (Devereux, 2006). Such circumstances raised questions about the pastoralist system. The availability of the feed is one of the key limitations. The issue of shrinking pasturage poses a severe danger to pastoral livelihoods. Natural grassland is the primary source of feed, but it lacks the necessary nutritious components for livestock to achieve the quality standards set by the market. In addition, attributable to the nation's rapid urbanization, the amount of grazing area has been declining. In the recent few decades, there has been a significant change in the land use patterns. The amount of pasturage that pastoralists have access to has been drastically reduced by the growing infrastructure, urbanization, and industrialization. Along with infrastructure investment, the massive increase in tourism, significant road building, hydropower plants, hotels, etc. across the filled arc of the grasslands forces pastoralists to constantly modify their migratory routes, which puts them through a great deal of hardship (Sharma et al. 2003). The decline of the environment is the additional factor. Pastoralism is currently a highly challenging industry to maintain, owing to poor ecological management. Another factor is land ownership changes, since regional and national land use policies permit regions to choose and utilize a specific grazing area (Abduletif, 2019). Reduced labour contribution in nomadic livestock rearing due to the rising sedentarization of pastoralists may trigger a paradigm shift from diverse pastoralism toward exclusively pastoral farming, reflecting a horrible loss of diversity throughout pastoralism. If these stressors persist, pastoral communities all over the world are likely to suffer worse outcomes in the future (Sharma et al. 2003; Dong et al. 2016).

Pastoralists consider availability to veterinary care and affordable, genuine medications as another biggest obstacle after grazing. They rely on their customary expertise to safeguard and treat sick animals. They are

List of Ethno veterinary practices used by pastoralists for treatment of livestock ailments

| Scientific name | Local name /Ingredient | Part used | Ethno-veterinary use(s) | Pastoralist community | References |
|--|---|--|---|----------------------------------|---------------------------------------|
| <i>Rumex hastatus</i> Linn | Kutch | Leaves | Applied on wounds and cuts | Bakarwal's | <i>Kirmani et al. 2020</i> |
| <i>Trigonella foenumgraecum</i> | Meethi | Seeds | Used for reducing swelling | Bakarwal's | <i>Kirmani et al. 2020</i> |
| <i>Cucumis melo</i> L. syno <i>Cucumis Cucumis callosus</i> (Rottler) cogn | Kachri (Arid fruit), Sugar, Mustard oil | Fruit | Used to treat diarrhoea in sheep and goat | Raika's | <i>Meena et al. 2020^a</i> |
| <i>Trifolium repens</i> L | BatakPanj/ Suliman 231, KASH | Raw aerial part | Used to treat milk deficiency in the cow and buffalo | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Curcuma longa</i> | Haldi | Rhizome | Used as antiseptic | Bakarwal's | <i>Kirmani et al. 2020</i> |
| <i>Iris kashmiriana</i> Baker | Kabriposh | Flowers | Used as antiseptic | Bakarwal's | <i>Kirmani et al. 2020</i> |
| <i>Curcuma longa</i> | Turmeric and Fitkari | Powder and paste | Used against fever in sheep and goat | Raika's | <i>Meena et al. 2020^a</i> |
| <i>Cannabis sativa</i> Linn. | Bhang | Leaves and inflorescence | Used in case of Indigestion | Gaddi's | <i>Singh and Misri, 2006</i> |
| <i>Butea monosperma</i> | Palas | Seed powder | Applied to kill maggots | Gaddi's | <i>Singh and Misri, 2006</i> |
| <i>Psyllium husk</i> Powder of isabgol | Isabgol | Leaves | Used against diarrhoea in sheep and goat | Raika's | <i>Meena et al. 2020^a</i> |
| <i>Trachy spermum ammi</i> L. <i>Sprague</i> | Black pepper, ajwain, black salt and turmeric | Mixture of Black pepper, ajwain, black salt and turmeric | Applied on mouth ulcers | Gaddi's | <i>Singh and Misri, 2006</i> |
| | Turmeric, acidic butter, Tea and black salt | Powder and paste | Used for the treatment of bloat in sheep and goat | Raika's | <i>Meena et al. 2020^a</i> |
| <i>Brassica napus</i> , <i>Nigella sativa</i> | Kali jiri, Rai and butter | Seeds | Used for the treatment of bloat in sheep and goat | Raika's | <i>Meena et al. 2020^a</i> |
| <i>Acacia catechu</i> Willd. | Khair | Decoction of Khair stem bark | Used against diarrhoea | Gaddi's | <i>Singh and Misri, 2006</i> |
| <i>Cucumis sativus</i> | Kheera | Fruit | Used against jaundice in sheep and goat | Raika's | <i>Meena et al. 2020^a</i> |
| <i>Cuscuta reflexa</i> Roxb. | Kukili pot, Gili Pot/ Suliman 280, KASH | Dried stem powder | Used as astringent in lambs and calves | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Allium cepa</i> , <i>Trachyspermum ammi</i> , <i>Coriandrum sativum</i> | Onion, ajwain, fenugreek and jaggery | Leaves powder and paste | Used against fever in sheep and goat | Raika's | <i>Meena et al., 2020^a</i> |
| <i>Tamarindus indica</i> | Imli | Whole plant | Used in case of Poisoning in cow/ buffalo/ sheep/ goat | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| <i>Hedera helix</i> L. | Bail | Leaf paste | Applied on the area of snake bite | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| <i>Saussurea costus</i> Falc. | Kuth | Paste of root | Applied topically in case of maggots in cow/buffalo/ sheep/ goat | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| <i>Coriandrum sativum</i> | Fenugreek, rock salt and fitkari | Powder and paste | Used against fever in sheep and goat | Raika's | <i>Meena et al. 2020^a</i> |
| <i>Angelica glauca</i> Edgew | Faka Gasse/ Suliman 295, KASH | Root powder mixed with tea | Used to treat gas and acidity in cattle | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Bergenia ciliata</i> (Haw.) Sternb | Zakhmihayat/ Suliman 30, KASH | Decoction of the rhizome | Used as antiseptic in foot and mouth disease | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Coccinia indica</i> Wight & Arn. | Vanlarh | Root | Used in case of Retention of placenta (ROP) in cow/buffalo/ sheep/ goat | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |

| | | | | | |
|---|--------------------------------------|--|--|----------------------------------|---------------------------------------|
| <i>Nepeta cataria L.</i> | Brarigasse/ Suliman 200, KASH | Decoction of shoot | Used to treat dysentery and diarrhoea in the cattle | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Brassica juncea L.</i> <i>Czern</i> | Mustard oil + Salt | Seed | Used against mastitis in cow and buffalo | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| <i>Allium victorialis L.</i> | Van ganda/ Suliman 243, KASH | Whole plant | Used to cure cold and cough ailments in cow and buffalo | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Trigonella foenum-graecum L.</i> + <i>Trachyspermum ammi L.</i> <i>Sprague</i> | Jaggery+Methi + Ajwain | Seed | Used to enhance milk production in cow/ buffalo | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| - | Desi ghee | | Used in case of milk fever in cow/ buffalo | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| <i>Butea monosperma</i> | Palash tree flower and wood | Flower and wood | Used for jaundice treatment in sheep and goat | Raika's | <i>Meena et al., 2020^a</i> |
| <i>Cannabis sativa L.</i> | Bengai | w/plant | Used for the treatment of anestrus in cow/ buffalo | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| <i>Cedrus deodara Loud.</i> | Deodar | Deodar oil | Ticks and lice is applied on the skin of the animals to kill flies, ticks and lice (Ectoparasites) | Gaddi's | <i>Singh and Misri, 2006</i> |
| <i>Bombax ceiba</i> | Semal | Paste of Semal bark and turmeric | Applied on dislocated bones | Gaddi's | <i>Singh and Misri, 2006</i> |
| | Desi babul and mehndi leaves | Desi babul and leaves of mehndi mix with cold water | Used for treatment of Itching in sheep, goat | Raikas | <i>Meena et al. 2020^b</i> |
| <i>Tamarindus indica L.</i> | Imli | Leaves | used against Foot and mouth disease (FMD) in cow/ sheep/ goat | Gujjar's, Bakarwal's and Gaddi's | <i>Khateeb et al. 2017</i> |
| <i>Persicaria alpina (All.) H. Gross</i> | Tsokemuth/ Suliman154, KASH | Leaf paste | Used to treat indigestion in the cattle | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Artemisia scoparia Waldst. & Kitam</i> | Tethwan | Leaves | Used as anti-helminth | Bakarwal's | <i>Kirmani et al. 2020</i> |
| <i>Cuscuta europaea L.</i> | Kukili Pot/ Suliman 281, KASH | Dried stem powder | Used against external parasites in the cattle | Gujjar's and Bakarwal's | <i>Dar et al. 2018</i> |
| <i>Pongamia pinnata Pierre</i> | Karanj | Leaf juice | Leaf juice is poured over the hooves of animal infected with FMD | Gaddi's | <i>Singh and Misri, 2006</i> |
| <i>Datura stramonium Linn</i> | Datur boel | Seeds | Paste of dried seeds is used for joint pain | Bakarwal's | <i>Kirmani et al. 2020</i> |
| | Turpentine oil and mustard oil | Turpentine oil (15 ml) mixed with mustard oil (300 ml) | Used in case of urea toxicity | Gaddi's | <i>Singh and Misri, 2006</i> |
| - | Custard apple mixed with mustard oil | Leaves powder | Used in case of constipation in goat/sheep | Raikas | <i>Meena et al. 2020^b</i> |

also very eager to gain from contemporary medicines because they are fully aware that certain contagious diseases with significant economic impacts cannot be handled solely by traditional methods. They prefer to self-administer the medications, but because they cannot read labels, they frequently use them improperly because they are unaware of the underlying concepts and lose their animals as a result, which negatively affects their ability to support themselves (Penrith,

2011). Pastoralists rely heavily on middlemen to market their livestock and other commodities. Despite the fact that traders frequently go to even remote places to buy animals, this has an adverse effect on their profit margins, often to a significant degree due to their weak negotiating position and limited access to market information (Legese et al. 2014).

Initiatives to enhance pastoralist's present condition: Overcoming the grazing difficulties :

- Permission to graze in the forest area
- Support for grazing on fallow lands after the harvest
- Permission to graze in neighbouring states on minimum charges

Programmes for providing veterinary assistance to animals:

- Vaccines and anthelmintics ought to be provided to pastoralists at a fair pace. The Animal Husbandry Department should organize their programmes to specifically target pastoralists

Financial policies aimed at boosting the economy:

- Pricing for animal - based products should be raised in accordance with the rise in the cost of other commodities
- Imported wool ought to be subject to taxes to promote domestic wool production

Mechanized techniques : New automated shearing techniques should be introduced to pastoralists

Control over the commercialization of animal products : The creation of co-operatives should be promoted because pastoralists are often cheated in the wool markets

Education : Education is a crucial component of development efforts. Alternative Basic Education, Open and Distance Learning, and Pastoralist Field Schools are some kinds of innovations that provide optimistic paths forward that need to be addressed

Recognition of pastoralists in various organisations: Pastoral representatives ought to be given the opportunity to express their views in various governmental and non-governmental organizations that deal with pastoralist welfare and the promotion of pastoral products

Assistance to pastoralists in times of need : Pastoralists need assistance during epidemics, natural disasters, and unintentional deaths due to confrontations with anti-social elements

CONCLUSION

Pastoralism is still a way of life, economic structure, and means of subsistence among pastoralists. Due to external shocks both natural and man-made; pastoralist livelihoods have become increasingly vulnerable. The destiny of pastoralism and its contribution to the country's economy and sustainable development are still uncertain because of the drought, shifting public policies and strategies toward pastoral communities, ongoing pastureland loss, population dynamics, extremely rapid climate change. The livelihood of

pastoral communities is presently a focus of concern across the globe. Even though they pursue a range of livelihoods, their level of participation is limited by a number of challenges, including a lack of finance, a lack of entrepreneurial experience, and market accessibility issues. Additionally, modifications in climatic variables like temperature, precipitation, and the incidence of extreme episodes like droughts have a direct impact on livestock output in pastoral areas. Therefore, emphasis should be placed on improving pastoralists' ability to diversify their sources of income by guiding them how to start their own businesses, how to pool their money to finance their ventures, and how to ensure that they have access to credit and markets. The review also reveals the prevalence of ethno-veterinary practices among pastoral communities, which may be due to scarce access to contemporary veterinary services and resistance to change. There are still issues with efficacy, quality, safety, and dose standardisation. Therefore, before further replication and application, it is imperative to assess the pharmacodynamics of these ethno-veterinary techniques.

REFERENCES

- Abduletif, A.A. (2019). Benefits and challenges of pastoralism system in Ethiopia. *Studia Mundi-Economica*, 6(3), 56-67.
- Ahmad, S. U. H. E. E. L.; Gangoo, S. A.; Sultan, S. M. and Dar, M. D. (2016). Ethnoveterinary practices and use of herbal medicine by pastoralists of Himalaya: A review. *Annals of biology*, 32(2), 260-268.
- Dar, M. S.; Khuroo, A.A.; Malik, A. H. and Dar, G. H. (2018). Ethno-veterinary uses of some plants by Gujjar and Bakerwal community in Hirpora Wildlife Sanctuary, Kashmir Himalaya. *SKUAST J. Res.*, 20(2), 181- 186.
- Devereux, S. (2006). Vulnerable Livelihoods in Somali Region. Institute of Development Studies Research Report, Ethiopia, 57.
- Dong, S.; Kassam, K. A. S.; Tourrand, J. F. and Boone, R. B. (2016). Building resilience of human-natural systems of pastoralism in the developing world. In K. A. S. Kassam, J. F. Tourrand, R. B. Boone (Eds.), *Shikui Dong, Karim-Aly S. Switzerland: Springer*.
- FAO. (2021). Pastoralism- Making variability work. FAO, Animal Production and Health Paper No. 185. <https://doi.org/10.4060/cb5855en>.
- IPCC. (2014). In: Core Writing Team, Pachauri, R.K. and Meyer, L.A. (Eds.), *Climate Change 2014: Synthesis report, Contribution of working groups I, II and III to the fifth assessment report of the inter-governmental panel on climate change*. IPCC, Geneva, Switzerland, 151 pp.

- Jenet, A.; N. Buono.; S. Di Lello.; M. Gomarasca.; C. Heine.; S. Mason.; M. Nori.; R. Saavedra. and K. Van Troos. (2016). The Path to Greener Pastures. Pastoralism, The Backbone of The World's Drylands. *Vétérinaires Sans Frontières International (Vsf International)*. Brussels, Belgium.
- Khateeb, A. M.; Khandi, S. A.; Bhadwal, M. S.; Dar, M. A.; Wani, S. A. and Bafanda, R. A. (2017). Indigenous Technical Knowledge Practices Followed by Pastoralists for the Treatment of Livestock Diseases in Hills of Jammu & Kashmir State in India. *Current J. Applied sci. and Tech.*, **27**, 1-9.
- Kirmani, N. R.; Banday, M. T. and Abdullah, M. (2020). Ethno-medicinal plants used by Bakarwals for treatment of livestock. *J. Ento. and Zool. Studies*, **8**(3), 1742-1745.
- Kishore, K. and Köhler-Rollefson, I. (2020). Accounting for pastoralists in India. League for Pastoral People and Endogenous Livestock Development, Ober-Ramstadt.
- Kreutzmann, H. (2013). The tragedy of responsibility in high Asia: modernizing traditional pastoral practices and preserving modernist worldviews. *Pastoralism: Research, Policy and Practice*, **3**(1), 1-11.
- Legese, G.; Haile, A.; Duncan, A. J.; Dessie, T.; Gizaw, S. and Rischkowsky, B. (2014). Sheep and goat value chains in Ethiopia: A synthesis of opportunities and constraints. *ILRI (aka ILCA and ILRAD)*.
- Manzano, P.; Burgas, D.; Cadahía, L.; Eronen, J. T.; Fernández-Llamazares, Á.; Bencherif, S. and Stenseth, N. C. (2021). Toward a holistic understanding of pastoralism. *One Earth*, **4**(5): 651-665.
- Meena, D. C.; Garai, S.; Maiti, S.; Bhatt, N. and Meena, B. S. (2020^b). Ethno-veterinary practices followed by Raika pastoralists of Rajasthan: A descriptive study. *J. Pharm. and Phyto.*, **9** (2S), 63-66.
- Meena, D.C.; Garai, S.; Maiti, S.; Dutta, S.; Meena, B. S. and Kadian, K. S. (2021^a). Migration pattern of Raika pastoralists of Marwar region in India. *Range Mngt. and Agrofo.*, **42**(1), 167-174.
- Meena, D.C.; Garai, S.; Maiti, S.; Meena, B.S.; Bhatt, N.; Chadda, A. and Meena, D.K. (2022). Adoption of improved goat husbandry practices among Raika pastoralists of Rajasthan. *Indian J. Small Rumi.*, **28**(1), 224-228.
- Meena, D.C.; Garai, S.; Maiti, S.; Meena, B.S.; Roy, S. K. and Kadian, K.S. (2020^c). Adoption of improved camel husbandry practices: An exploratory study among the Raika pastoralists of Rajasthan. *Indian J. Ext. Edu.*, **56** (3), 116-119.
- Meena, D.C.; Garai, S.; Maiti, Sanjit.; Bhakat, Mukesh.; Meena, B.S. and Kadian, K.S. (2020^e). Ethno-Veterinary practices used for common health ailments of sheep and goat: A participatory assessment by the Raika pastoralist of Marwar Region, Rajasthan. *Indian J. Animal Sci.*, **90**(9), 1310-1315.
- Meena, D.C.; Garai, S.; Maiti, S. and Mandi, K. (2019). Pastoralists in modern india: current status and future prospectus. In Jayakumar R (Ed), *Res. Trends in Multidis. Res.*, pp. 21-33). AkiNik Pub..
- Meena, D.C.; Garai, S.; Maiti, S.; Meena, B.S.; Chadda, A. and Latha, C. Madhu. (2021^b). Adoption of Improved Sheep Husbandry Practices among the Raika Pastoralists of Marwar Region of Rajasthan. *Indian Res. J. Ext. Edu.*, **21**(4), 14-18.
- Mohammed, Y. (2010). Is It A Silent Travel to Death? Case of The Subaltran Children of Lucy. Uppsala, Sweden.
- Muricho, D.; J. David. and O.K. Willis. (2018). The role of pastoralists indigenous knowledge and practices in reducing household food insecurity in West Pokot, Kenya: A binary probit analysis. *J. Devel. and Agril. Eco.*, **10**(7): 236–245.
- Onono, J.; P. Mutua.; P. Kitala. and P. Gathura. (2019). Knowledge of pastoralists on livestock diseases and exposure assessment to brucellosis with in rural and peri-urban areas in Kajiado, Kenya. *F1000 Research*, **8**: 1916 <https://doi.org/10.12688/f1000research.20573.1>.
- Penrith, M. L. (2011). High impact disease. fact sheet. www.afrivip.org/, p. 3648. [Accessed August 22, 2016]
- Rollefson, K.. Ilse. and Kishore, K. (2021). Meat atlas facts and figures about the animals we eat; By Heinrich-Böll-Stiftung, Friends of the Earth Europe and BUND für Umwelt und Naturschutz Deutschland. <https://eu.boell.org/en/2021/09/07/pastoralism>.
- Saberwal, V. K. (1999). Pastoral politics: shepherds, bureaucrats, and conservation in the western Himalaya. *Oxford University Press*.
- Schoof, Nicolas. and Luick, Rainer. (2018). Pastures and Pastoralism. Oxford Bibliographies: Ecology. Oxford Bibliographies. doi:10.1093/obo/9780199830060
- Shaoliang, Y. and Sharma, E. (2009). Climate Change and the Hindu Kush-Himalayan Rangelands. Information Sheet # 8/09, ICIMOD, Kathmandu, Nepal.
- Sharma, V. P.; Köhler-Rollefson, I. and Morton, J. (2003). Pastoralism in India: a scoping study. Indian Institute of Management and League of Pastoral Peoples, Ahmedabad, India.
- Singh, K.S. (1996). Peoples of India Series, Anthropological Survey of India, New Delhi.
- Singh, R. and Misri, B. (2006). Traditional goat health management practices in Chamba district of Himachal Pradesh.
- UNOCHA. (2007). The Future of Pastoralism in Ethiopia. Addis Ababa, Ethiopia: UNOCHA Pastoralist Communication Initiative.

