

**SMALL RUMINANT REARING AMONG BAKERWAL
PASTORALISTS OF JAMMU & KASHMIR –
AN EXPLORATORY STUDY**



**THESIS SUBMITTED TO THE
ICAR- NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL
(DEEMED UNIVERSITY)
IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF**

**DOCTOR OF PHILOSOPHY
IN
VETERINARY EXTENSION EDUCATION**

**BY
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M.V.Sc. (Veterinary Extension)

**DIVISION OF DAIRY EXTENSION
I C A R - NATIONAL DAIRY RESEARCH INSTITUTE
(DEEMED UNIVERSITY)
KARNAL -132001 (HARYANA), INDIA**

2015

Regn. No. 1121202



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TO MY
ELDER BROTHER
FIRDOUS

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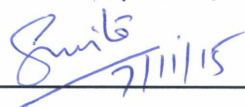
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This is to certify that the thesis entitled, "**SMALL RUMINANT REARING AMONG BAKERWAL PASTORALISTS OF JAMMU & KASHMIR - AN EXPLORATORY STUDY**" submitted by **Mr. SAJAD AHMED WANI** towards the partial fulfillment of the award of the degree of **DOCTOR OF PHILOSOPHY IN VETERINARY EXTENSION EDUCATION** of the **ICAR - National Dairy Research Institute (Deemed University), Karnal (Haryana), India**, is a bonafide research work carried out by him under my supervision, and no part of the thesis has been submitted for any other degree or diploma.

Dated:

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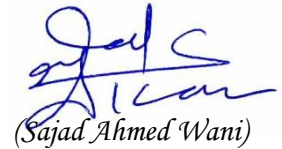
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Date: November 2015



(Sajad Ahmed Wani)

Abstract

There are more than 200 tribes in India comprising about 6 percent of the country's population and among different tribes of Jammu & Kashmir, Bakarwals - the *high-altitude goatherds/shepherds*", represent the largest small ruminant rearing pastoralist group in Northern Himalayan region of the state. Bakarwals live under constant stress and threat imposed by issues like: increasing commoditization; rising inequality within livestock economy; out-migration of poor pastoralists; periodic dislocations brought about by drought, floods and civil war; changing land use pattern; and abrupt climate changes. Hence, a study entitled "*Small Ruminant Rearing among Bakarwal Pastoralists of Jammu & Kashmir – An Exploratory study*" was undertaken. Jammu & Kashmir was selected purposively for the study and 6 major routes of migration were explored. Twenty respondents were selected randomly from each route making a total of 120 respondents. It was observed that 43.33 per cent of the respondents were having a composite flock in range of 185-285 small ruminants. There were 5 marketing channels for sale of live animals and two marketing channels for sale of wool in the study area. It was calculated that the age at first kidding and lambing was in the range of 21.80 ± 3.22 and 20.16 ± 3.06 months in goat and sheep, respectively. The most serious problem during migration was lack of shelter for the animals and humans. Major morbidity was due to parasites in goat and foot rot and parasites in sheep. High mortality was due to Kamni (Enterotoxemia) and Sari (PPR) in both sheep and goat. The composite value of livelihood security of respondents was very low (0.40). Respondents were mostly insecure in their social and physical assets but relatively secure in their natural and human assets. Opportunities and Strengths were dominant over Weaknesses and Threats in small ruminants rearing by the Bakarwal. As Bakarwal livelihood relies primarily on small ruminant rearing, employing communal grazing for the purpose, so the health of the pastures and flora on the route of migration needs to be protected and promoted. Organized marketing system needs to be developed to reduce the number of intermediaries for making small ruminant rearing more remunerative. Livelihood security of the pastoralists needs to be ensured and alleviated by providing various social and physical infrastructure facilities.

सारांश

भारत में 200 से अधिक जनजातियाँ हैं जो देश की आबादी का लगभग 6 प्रतिशत हैं। जम्मू और कश्मीर की विभिन्न जनजातियों में बकरवाल जनजाति प्रमुख हैं। जो की प्रदेश के उत्तरी हिमालय क्षेत्र में जुगाली करने वाले छोटे पशुओं को चारा राह में चराने के मुख्य समुदाय है। इस समय बकरवाला दवाब और चुनौतियों का सामना कर रहे हैं जो कि बढ़ते वस्तुनीय करण, पशुधन अर्थव्यवस्था में असमानता, गरीब चरवाहों का प्रवास, समय-समय पर सूखा पड़ना, बाढ़, युद्ध, बदलते भूमि उपयोग के तरीकों और अचानक जलवायु परिवर्तन का परिणाम है। इसकी विस्तृत जानकारी प्राप्त करने के लिये एक खोजपूर्ण अध्ययन किया गया जिसका शीर्षक जम्मू और कश्मीर में बकरवाल चरवाहों द्वारा जुगाली करने वाले छोटे पशुओं का पालन दिया गया। अध्ययन के लिये जम्मू और कश्मीर को उद्देश्यपूर्ण चुना गया और प्रवास के 6 मुख्य मार्गों का पता लगाया गया तथा 20 उत्तरदाता प्रति मार्ग बेतरतीन ढंग से चयनित किये इस तरह कुल छ (6) मार्गों से 120 उत्तरदाता कर साक्षात्कार किया गया। अध्ययन में यह पाया गया कि लगभग 43.33 प्रतिशत उत्तरदाता 185 से 285 जुगाली करने वाले छोटे पशुओं को समूह में रखते हैं। तथा अध्ययन क्षेत्र में यह भी पाया गया कि जीवित पशुओं को बेचने के लिये पाँच (5) और ऊन बेचने के लिये दो (2) विपणन के तरिके हैं। गणना करने पर यह भी पता चला की बकरी में प्रथम बच्चा देने की उम्र लगभग 21.80 ± 3.22 माह और भेड़ के प्रथम बच्चा देने की उम्र 20.16 ± 3.06 माह है। प्रवास के दौरान प्रमुख गंभीर समस्या पशुओं और मनुष्यों के लिये आश्रय की कमी थी। बकरियों में मृत्यु का मुख्य कारण परजीवी तथा पैरों में सड़न और भेड़ में परजीवी पाये गये। भेड़ों और बकरियों दोनों में ही ज्यादा मृत्युदर कमनी(ET) और सारी (PPR) बिमारी के कारण हुई। बकरवालों की आजीविका का मान बहुत कम (0.40) था। उत्तरदाता सामाजिक और भौतिक सम्पत्ति के लिये अपेक्षाकृत सुरक्षित थे। बकरवालों के लिये छोटे पशुओं के पालन में अवसर और मजबूती, 'SWOT' के मुख्य उभरते हुए धटक थे। बकरवालों द्वारा जुगाली करने वाले छोटे पशुओं के पालन का उद्देश्य सामप्रदायिक चराई के रूप में रोजगार पाना है इसलिये प्रवास के मार्ग पर चराई और वनस्पति को बचाने पर जोर दिया जाना चाहिये। संगठित विपणन प्रणाली से जुगाली करने वाले छोटे पशुओं को और अधिक लाभकारी बनाने के लिये बिचौलियों की संख्या को कम करने के लिये विकसित करने की आवश्यकता है। बकरवालों की आजीविका की सुरक्षा हेतु विभिन्न सामाजिक एवं भौतिक बुनियादि सुविधाओं को उपलब्ध कराने पर जोर दिया जाना चाहिए।

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CHAPTER –1

Introduction

1. INTRODUCTION

Pastoralism is an age-old livelihood option for number of communities and ethnic groups in the mountains, using mainly traditional knowledge to optimize the interaction between humans, the environment and livestock. Pastoralism is a system of production devoted to gaining a livelihood from the care of large herds of animals. This is a form of adaptation of natural resource management, which requires maintaining an ecological balance between pastures, livestock and people. The technology of the pastoralist requires that the life-practices of the people be adjusted to the requisites of the animals which are movement to pasture, water, salt as required and protection from predators.

A pastoral nomadic lifestyle is an adaptation to, dry cold rangelands with extremely harsh environments that are non-arable and limited in their production capacity. Their way of life prevents living in permanent settlements. Pastoral populations are organized into descent groups like tribes, clans and lineages. It is acknowledged that social organization of pastoral nomads is based on kinship. However, it is not only nomadic societies, where kinship and pseudo-kinship form the structural basis of social organization, many other societies with different economic systems also have kinship base. The mobility of nomads and the permanent instability of pastoral economy give rise to a fluid social organization, which is capable of change and which has the requisite segmentry means with which to accomplish this. The scheduling and destinations are predetermined according to the availability and needs of the animals for water and fodder.

The Bakerwal pastoralists follow established migration routes and often develop long standing exchange arrangements with families to make use of crop residue or trade goods. Traditionally, the vagaries of the natural environment are overcome through access to and management of communal rangelands, mobility of stock, and institutions for mutual assistance.

The most commonly used definition of pastoralism is the one given by Swift (1988) according to which, "pastoral production systems are those in which at least 50 percent of the gross incomes of households (i.e. the value of market production and the estimated value of subsistence production consumed by households) come from pastoralism or its related activities, or else, where more than 15 percent of households food energy consumption involves the milk or dairy products they produce". So it is necessary for them to have knowledge of their pastures, water resources, rainfall, snowfall, disease, political insecurity and national boundaries with access to markets and infrastructure.

In Indian context, pastoralism can be defined as "members of caste or ethnic groups with a strong traditional association with livestock-keeping, where a substantial proportion of the group derive over 50 per cent of household consumption from livestock products or their sale, and where over 90 per cent of animal's feed and fodder is from natural pasture or browse, and where households are responsible for the full cycle of livestock breeding" (Sharma *et al*, 2003). Pastoralists have adapted to the reality of the land on which they live and are able to pursue productive livelihoods in what many outsiders consider vulnerable and fragile regions.

Pastoralists have developed extensive traditional knowledge about their environment and have evolved strategies that allow them to survive and thrive in arid lands. For pastoralists themselves, pastoralism is not just a production system: it is a viable and important livelihood and existence. Some studies have treated the pastoralists as a people who resisted change because of tradition or because they reacted passively to the vagaries of nature. Other scholars feel that pastoralists as an occupational group are open to continuous change.

No culture is static and pastoralists are no exception. Cultural borrowing and adaptation in time and space has been a continuous process, yet pastoralists have preserved their culture in form and structure. Nonetheless, it is important to explain the system so that outsiders can understand it. The pastoralist management system involves a complex set of four elements that are linked together by a requirement

for land and a responsibility to safeguard it. They include (1) mobility, (2) keeping or possessing large herds of livestock, (3) herd diversification and splitting, and (4) focused mutual assistance systems. Pastoralist populations are facing more pressures to their way of life than ever before.

1.1 PASTORALISM IN INDIA

There are more than 200 tribes comprising six per cent of the country's population engaged in pastoralism. (Sharma *et al.*, 2003). India is home to a large number of pastoral groups – which include Golla and Kuruma of Andhra Pradesh, who move with their cattle and sheep respectively; Rabari and Bharwad from Gujarat, who raise flocks of sheep and goat and cattle and small stock respectively; Kuruba and Dhangar from Karnataka both raise sheep flocks; Raika/ Rabari and Gujjars from Rajasthan who raise Camel and Gaddi from Himachal Pradesh raise Sheep and Goat. The Gujjar and Bakarwals of Himalayas rear their buffalo and Sheep and Goat respectively. Raika / Rabari are the most numerous pastoral groups in the western part of India. Gujjar and Bakarwals in India are spread throughout the northern part of the Himalayan Range. This includes the states of Uttarakhand, Himachal Pradesh, Jammu and Kashmir and Punjab. Nomadic pastoralism is prevalent in the dry land of western India, the Deccan Plateau and in the mountainous regions of Himalayas.

India has one of the largest livestock populations in the world. Livestock contributes about 25 per cent of India's agricultural GDP. Livestock provides local people in isolated areas with milk, meat and wool. Pastoralists use marginal, otherwise uncultivable land, increasing the amount of land available to an already expanding population. They also rear indigenous animal breeds, retaining rich genetic variety. In spite of being in such a large number, these pastoral communities have very low public and political profile. Scientists also point fingers at them for adhering to an obsolete form of production, despite their large contribution to the national economy in terms of production of milk, meat, wool, leather etc.

1.2 CLASSIFICATION OF PASTORALISM IN INDIA

Pastoralism can be categorized in a number ways. The most important of these are

by degree of movement, species management strategy, geography and ecology. The most common categorization is by degree of movement, from highly nomadic through transhumant to agro-pastoral (Blench, 2000). Major types of pastoralists in the Himalayas are:

Nomadic Herders: Van Gujjars of Uttaranchal and Himachal Pradesh and Changpas of Ladakh, Jammu & Kashmir migrate from one pasture to another with their whole families. They don't cultivate land and their entire livelihood revolves around pastoral activities. They mostly depend on their neighboring agricultural commodities for cultivable goods for which they perform extensive economic exchange with them.

Semi Nomadic Pastorals:

Gaddis and Bhotias of North Western Himalayas seasonally migrate to higher pastures with their animals. These nomadic groups own cultivable land and during half of the year are involved in agricultural activities. Bhuttias living in the Lachen and Lachung valleys of Sikkim and Monpas of Arunachal Pradesh are also included in this category.

Long-Distance or Transhumant Herders:

Village pastoralists practice long distance herding of livestock and are considered to be transhumant herders. Transhumance is grazing strategy “ ... in which the livestock is generally accompanied by hired men but also by owners and their relatives, but rarely by a whole family, on a long migration or transit between to seasonal ranges” .

1.3 TRIBAL COMMUNITIES AND PASTORALISM IN JAMMU & KASHMIR

The constitution of Jammu and Kashmir has notified twelve communities as the scheduled tribes. The total tribal population enumerated officially for the first time during the census 2001, recorded the population of 1,105,979. The scheduled tribes account for 10.9 per cent of the total population of the state and 1.3 per cent of the tribal population of the country. Most of these tribes are found in Ladakh region of the state. Out of twelve Scheduled Tribes, Gujjar is the most populous tribe having

a population of 763,806, thus forming 69.10 percent of the total Scheduled Tribe population. Bot is the second major tribe having a population of 96, 698, followed by Bakarwal (60,724) and Brokpa (51,957). Gujjar along with the three tribes constitute 88 per cent of the total tribal population.

The Gujjar and Bakarwal tribes are mostly found in Jammu and Kashmir provinces of the state. Bakarwals are found in almost every district of the state but they are mostly concentrated in the districts of Poonch, Rajuri and Khatua of the Jammu and in Kashmir valley they are mostly found in Anantnag, Badgam, Pulwama, Kulgam and Kupwara districts. The two groups ; Gurjars and Bakarwals of Jammu & Kashmir are closely associated. Bakerwals have the same gotra and clan like Gujjars. Both Gujjars and Bakerwals according to the historians initially belonged to Rajputana region of Kathiawad. Name Bakarwal is derived from the Hindi/Urdu/Punjabi/ Kashmiri/ Dogri terms, Bakri/Bakar meaning `goat /sheep` and wal meaning `one who takes care of`. Basically, the name in `Bakarwal means `high-altitude goatherds/shepherds. Bakarwals lead a lonely and tough life in the high-altitude meadows of the Himalayas. Every year, the Bakarwals take their sheep high into the mountains, above the tree-line to graze in the lush meadows. It may take them as many as sixty days to reach these meadows. During the summer, they move from one meadow to the other. The Bakarwal tribes generally travel in pairs but generally at times they prefer to go alone or in larger groups. Most of the time, they are accompanied by their dogs, which include the famous (Bhotia) Bakerwal dogs and other animals. Bakarwals are known as Dhangar in the rest of India and belong to the same ethnic stock as the Gurjars, and inter- marriages freely take place among them.

1.4 TRANSHUMANCE

Transhumance is the regular movement of herds between fixed points to exploit seasonal availability of pastures. In hills, the transhumant pastoralists follow a cyclical migratory pattern from cool highland valleys in summer to warmer lowland valleys in winter. In the terms of ecological adaptations, the two most significant factors for transhumance are seasonal severity of winters, associated with

presence of territorial use of highland and lowland pastures.

Transhumant agro-pastoralists have regular encampments or stable villages with permanent houses. They often practice subsistence level agriculture at one or the other destinations in summer. They trade their animals and animal products in town markets for grains and other necessities of life, which they do not produce themselves. Ethnic groups in transhumant category are few and are of low population density in relation to the total land mass. There is low margin of surplus because of low level of technology, little occupational specialization, high participation of women in the economy and highly flexible residence. The emergent pattern of social structure has kinship and functional groups that helps in meeting the demands of a migratory mode of production. As all follow the same mode of production, there is little variation in economic level and behavior from one household to another. The relations of economic control, which are legally manifested as property ownership are absent in transhumant societies.

Transhumance may be considered to be a human adaptation to marginal and spatially variant environments with a view to optimizing the use of natural endowments changing over time and varying space (Bhasin, 2011). In Jammu and Kashmir, Bakarwals are goat and sheep rearing transhumant, who oscillate between high and low altitudes in the hill tracts of Jammu & Kashmir with their flocks and household goods. Their economy mainly depends on the products of their flock and the use of natural pastures round the year. Mostly Bakerwals are seen in different seasons of the year in the areas extending from Poonch to Khatua in the south (Jammu region) and over the greater Himalayan ranges in the north (Kashmir Valley). This strip of land from south to north is roughly rectangular in shape. It is approximately 250-300 kms long and 200-250 kms wide. The entire area traversed by them is a succession of ranges and valleys comprising Shwaliks, Pir Panjal, Kashmir Valley, Side Valleys and Greater Himalayan ranges. In this strip of land the transhumant Bakarwals plan their annual activities according to set schedules (Khatana, 1992).

1.5 STATEMENT OF THE PROBLEM

Bakerwals form the largest small ruminant rearing pastoralists in Himalayan region of Jammu & Kashmir. They practice nomadic and semi nomadic transhumant pastoralism which is under intense transformations in recent decades due to socio-political and land use changes. Climate change is also affecting their livestock and seasonal migration cycle. They are living a lonely life in far flung areas cut off from the main cities and towns. They are deriving their livelihood from the presumably unproductive lands which are not fit to be used for agricultural purposes.

The Bakerwals are socially, economically and politically marginalized group of people who are mostly living below poverty line and have very little access to the various social, educational and health services provided by the state government. Goat and Sheep rearing form the core economic activity of Bakarwals for their livelihood. They have been involved in this profession for last many and many generations. They are using their own traditional knowledge in the management of their flock of animals. Major proportion of the Goat and Sheep population of the state is managed under extensive system of rearing by these Bakerwals. They are also taking small ruminant flock of other settled people from the villages for pasturing with them during the summer months to increase their economic returns.

The Bakerwals are making a huge economic contribution to the state's agricultural GDP by providing livestock products like meat, skin, wool, milk and organic manure. Besides this they have a very good role in the genetic conservation of the indigenous breeds of animals. The nomadic lifestyle and economy is increasingly under stress from contemporary socio-political and ecological changes throughout the globe. On the one hand, they are facing various socio-economic and political pressures, including state policies and interventions, population growth, land-use change and integration into a market economy; and on the other hand, they are exposed to climate change and its impacts on their environment and life. The sedentarization of the Bakarwal tribals in Jammu & Kashmir started in the late 20th century and is still going on.

Pasture scarcity, access to education and health services, unstable political atmosphere etc. were reported as basic factors for settlement of Bakarwals by Sofi (2013). Despite the fact that nomadic herders are amongst the most food insecure

groups in the area, pastoral systems have received little or no attention from researchers and extension services.

Every research tries to answer certain logical questions in its present context to offer solution to certain problems henceforth. The following research questions were focused in the present study:

1. What are the social, cultural and migratory aspects of the Bakarwal?
2. What management practices are followed by the Bakarwal in small ruminant rearing?
3. What is the role of small ruminant rearing in the livelihood among Bakarwals?
4. What are the internal and external factors that have bearing on the livelihood of Bakarwal?
5. What are the challenges and opportunities in small ruminant rearing among Bakarwal?

It was with the above discussed views and questions in mind a study was planned to be carried out in Jammu & Kashmir state to pinpoint the key issues of socio-cultural importance and to ascertain the livelihood security and future prospects of the small ruminant rearing among the Bakarwals pastoralists. The Goat and Sheep rearing practices of Bakarwals were also studied to get an insight into various shortcomings and management problems and to suggest suitable remedies. However to find out the suitable answers of above questions a study entitled “**Small Ruminant Rearing among Bakarwal Pastoralists of Jammu & Kashmir – An Exploratory Study**”, was conducted with the following specific objectives:

1. To explore the socio-cultural and migratory aspects of Bakarwal pastoralists of Jammu & Kashmir
2. To study the management practices followed by the respondents in small ruminant rearing
3. To measure the livelihood security of Bakarwal pastoralists through small ruminant rearing
4. To find out the challenges and opportunities in small ruminant rearing among Bakarwal pastoralists

1.6 SCOPE OF THE STUDY

According to Swift (1988), pastoral production systems are those “in which at least 50 percent of the gross incomes of households (i.e. the value of market production and the estimated value of subsistence production consumed by households) come from pastoralism or its related activities, or else, where more than 15 percent of households” food energy consumption involves the milk or dairy products they produce”. Pastoral livelihoods are characterized by risk and uncertainty due to fluctuating environmental conditions and occasional shocks (Scoones, 1995). The study helped in understanding the Bakarwal tribals in great detail. Through this study we can have understanding of the socio-economic, cultural and environmental conditions of the respondents in the study area. We have also documented the knowledge of existing management practices in small ruminant rearing followed by the Bakarwals. Livelihood security analysis of Bakarwals and SWOT analysis of the of small ruminant rearing in the study area could also be of a great help to formulate effective and need based programmes to improve the livelihood security of Bakarwals, besides the study could also help policy makers in targeting better development programmes.

1.7 LIMITATIONS OF THE STUDY

Although every effort has been made to make this study as comprehensive as possible, it is subjected to the inherent limitations in the single researcher project. Some of the limitations are indicated below:

- The findings of the study are based on the expressed responses of the Bakerwals, their perception, ability to recall and opinions expressed by them. Hence, the complete freedom from individual bias, stereotypes and prejudices cannot be claimed.
- Due to the limitations of time and other resources, the study was conducted with small sample size and few selected variables for qualitative and quantitative assessment.
- The assessment procedure of the livelihood security of Bakerwal pastoralists in this investigation was the maiden attempt in the field of Agricultural extension in India. Therefore, this procedure may need further refinement.

- The present study investigated the transhumant pastoralism involving cyclic vertical movements in the different seasons of the year. It differs from the pastoral systems prevalent in most parts of our country. Thus the results of the study may be extra plotted only to similar pastoral systems.
- The study was confined to a small sample of Bakerwal pastoralists who were scattered in distribution because of their nomadic- semi nomadic or transhumant mode of life. So universal applicability of the results cannot be claimed.

Despite the above limitations, sincere attempts and considerable thoughts have been exercised in making the study as objective as possible.

1.8 PRESENTATION OF THE STUDY

This study is presented in six chapters as follows:

Chapter-1: Deals with the brief ***Introduction*** including objectives, limitations and scope of the study.

Chapter-2: Deals with ***Review of Literature*** which is relevant to the problems taken for the study.

Chapter-3: Devoted for describing the ***Research Methodology*** followed in the present investigation. It includes the location of the study, selection of the respondents and sampling procedure, selection of variables, methods and devices used for collection of data and used statistical tools.

Chapter-4: Dealt with ***Results and Discussion*** of the study in accordance with its objectives.

Chapter-5: Dealt with the ***Summary and Conclusions*** and consists of implications of the study and suggestions for future research.

Bibliography, Annexures and Appendices have been presented in the end of the thesis.

CHAPTER –2

Review of Literature

2. REVIEW OF LITERATURE

A comprehensive review of literature is a part and parcel of almost all scientific researches. For any scientific investigation, previous findings provide basis to the research. Perusal of the available literature is of great importance in gaining an insight into the research problem under the study. The review of literature is one of the important aspects in the research process. It helps the researcher to keep his work going in right and appropriate direction. It further helps in the interpretation of the findings. Hence, the literature that is related are reviewed and presented in the following sub heads:

2.1 Socio economic and cultural characteristics of small ruminant rearing pastoralist groups

2.2 Migration aspects of small ruminant rearing pastoralists

2.3 Management practices followed in migratory flocks of small ruminants

2.4 Marketing pattern of small ruminants among pastoralists

2.5 Problems in small ruminant rearing among pastoralists

2.6 Livelihood security of pastoralists

2.7 Opportunities and challenges in small ruminant rearing

2.1 SOCIO ECONOMIC AND CULTURAL CHARACTERISTICS OF SMALL RUMINANT REARING PASTORALIST GROUPS

The United Nations Development Programme (UNDP) estimated that 100–200 million people rely on strict nomadic or transhumant pastoralism (FAO, 2011).

2.1.1 AGE

Ansari et al., (2013) reported that all household heads were male; 47 per cent were between 31 and 60 years old, 30 per cent were older than 60 years and only 17 per cent were 30 years old or younger. In total, 74 per cent of the family members were

between 15 to 65 years of age and only 6 per cent and 20 per cent were older than 65 or younger than 15 years of age, respectively.

Thilakar and Krishnaraj (2010) reported in their study that nearly one-half (40.83 %) of the respondents were of old age and 21.67 per cent belonged to young age group. Further there were 37.50 per cent of the respondents who were in the middle age group.

Porwal et al., (2006) reported in their study that among the males 1.21, 0.84 and 1.01 percent and among female 1.91, 0.52 and 1.19 per cent heads belonged to adult, 12-18 years of age and <12 years of age category, respectively.

2.1.2 EDUCATION

Suresh et al., (2011) reported the literacy rate was quite low at 31 per cent; it was the highest in small farmers and the lowest in large farmers in migratory sheep rearers in Rajasthan.

Thilakar and Krishnaraj (2010) reported that among the respondents 64.17 per cent had primary to secondary level of education, while 35.83 per cent were illiterates.

Porwal et al., (2006) reported that among the males 1.18, 11.76, 25.88 and 12.94 per cent of the respondents were graduate, higher secondary, secondary and primary education, respectively while predominantly 48.24 per cent were illiterate. The education level in female of the family was different, in that 87.06 per cent were illiterates.

Dev et al., (2003) reported that the distribution according to education indicates that the majority of the grazer families were illiterate. Average literacy was 26.00 per cent in the study area of north-west Himalaya. The lowest literacy rate of 20.00 per cent was found in the marginal group and 21.00 per cent of the families had no literate person. None of the women were found to be literate.

2.1.3 FAMILY TYPE AND FAMILY SIZE

Suresh et al., (2011) reported that about one-third of the total farming households belonged to the joint family system. However, within the same family, independent ownership as well as management of flock also existed.

Thilakar and Krishnaraj (2010) reported that about one-half of the respondents had four to five members in their family.

Singh et al., (2006) reported that the average family-size and landholding varied widely according to flock-size. The number of migratory family workers (male) was higher for large than small flocks.

Porwal et al., (2006) reported that the average family size of sheep farmers was 6.68 of which 3.06 were males and 3.62 female.

Dev et al., (2003) conducted their study in North Western Himalayas and revealed that the average family size was 6.8, and varied from 6.3 to 7.7 in different categories.

2.1.4 LAND HOLDING

Rao et al., (2013) reported that 60.10 per cent of shepherds had less than 2.5 acres land in North Coastal Zone of Andhra Pradesh.

Suresh et al., (2011) reported in their study in Rajasthan that sheep rearing was undertaken by a large number of the landed class of farmers; about three-fourths of the sheep farmers belonged to semi-medium, medium and large categories of farmers. They also reported that the percentage of sheep farmers migrated increased as landholding size increased.

Thilakar and Krishnaraj (2010) reported that majority of the respondents were landless farmers (75.83 %) followed by marginal (15.83 %) and small farmers (8.33 %). It was also noted that none of the respondents was a large farmer who had more than 5 acres of land.

Singh et al., (2006) reported that the average size of landholding was 0.30 ha for small and 0.77 ha for large flock-owners. The large flock-owners had some pasture

land. They also concluded that resource endowments such as family workers and landholdings have direct bearing on the flock size.

Porwal et al., (2006) reported that among the sheep farmers 18.82 per cent were land less and 81.18 per cent had average 5.57 ha land holding of which 1.90 ha was irrigated, 2.02 ha un irrigated and 1.65 ha waste land. All the sheep farmer family owned house of which 50.6 per cent was mud structure and 49.4 per cent stone/ concrete/ brick structure.

Dev et al., (2003) reported that all the households were found to possess some land as an operational farm holding at their native place. It was also revealed that the area of holding in all the categories was less than one hectare. They indicated a positive association between land holding and flock size. The marginal group possessed only 0.28 ha average size land holding, while maximum land holding of 0.72 ha was with the large category. Average land holding across all categories was only 0.48 hectare.

2.1.5 OCCUPATION

Rao et al., (2013) reported that the agriculture was the main occupation of sheep farmers of the North Coastal Zone of Andhra Pradesh followed by animal husbandry (69.06 vs. 23.23).

Thilakar and Krishnaraj (2010) reported that majority (92.50 %) of the farmers followed sheep farming as main occupation with large flock size (> 30).

Sharma et al., (2007) also reported that 66 per cent of the goat keepers in Nathwara, Vallabh nagar, Railmagra and Devgarh areas of Rajasthan were dependent on agriculture and animal husbandry for their livelihood.

Porwal et al., (2006) reported that 84.7 per cent of respondents indicated sheep farming as main occupation while 11.8, 1.2 and 2.3 per cent indicated conventional agriculture, milk selling and bullock cart driving, respectively as main occupation.

2.1.6 ANNUAL INCOME

Rao et al., (2013) reported that majority of the sheep farmers were earning less than Rs. 25,000/- per annum and the highest mean house hold income (Rs.) of North

Coastal Zone of A P recorded was 18781.92 ± 260 . Most of the sheep farmers come under below poverty line and their major income was obtained from sheep farming.

Thilakar and Krishnaraj (2010) reported that the annual income of respondents ranged from Rs.12001 to 24000/- as most of the farmers possessed medium to large flock size and they were able to sell 15 to 20 sheep per year.

Swarnkar and Singh (2010) reported that the major source of income was through sale of animals that accounted for 75.3 per cent of total income. The income from manure and wool accounted for 13.5 per cent and 11.2 per cent, respectively.

Porwal et al., (2006) reported that the labor hired for grazing was either paid in monthly basis (53.33 %) or on annual contract (46.67 %). The labor charges for grazing and management of the sheep ranged from Rs. 45 to 150/animal/year with average of Rs.82.80/animal/year.

Katoch and Kumar (2005) reported that the sheep and goat provided farmers with meat, wool, milk, hide, skin etc., which are of immense economic value. The tribals slaughter the animals for meat during winters, as no other supplementary protein rich source of diet is available. During summers, they get the wool and use it to make carpets, blankets and woolen clothes (pullovers, caps, socks, gloves and shawls etc.). These products were sold in the local market as well as in Kulu Dusshera, an international fair in Himachal Pradesh. Hide/skin was also used as carriers for grains.

2.1.7 SOCIAL PARTICIPATION

Ansari et al., (2013) reported that the nomads do not have access to standard financial markets, including banks. Livestock offer an alternative for storing their savings or accumulated capital as a 'living savings account' (Randolph et al., 2007). This living savings account can be sold and converted into cash as needed and provides an instrument of liquidity as well as an alternative form of insurance for the family. In addition, livestock has the advantage that it can be sold at any time during the year (Vandamme et al., 2010), unlike crops which are highly seasonal.

Thilakar and Krishnaraj (2010) reported that among the respondents around 88 per cent of the farmers were not participating in any formal organizations.

Porwal et al., (2006) reported that among the respondent only one per cent of the farmers were members of village societies. 45.88 per cent of the respondents obtained loan for sheep rearing and 25.88 per cent for family obligation from financial institutions.

2.1.8 SOURCES OF INFORMATION

Ansari et al., (2013) reported that among those interviewed, 41 per cent and 32 per cent of nomads received marketing information from traders and neighboring farms, while 14 per cent and 13 per cent received their information from livestock associations (such as the Agriculture Organization in Baft city) and markets, respectively.

Thilakar and Krishnaraj (2010) reported majority of the respondents had medium extension agency contact, medium mass media exposure and credit behaviour.

2.1.9 CULTURE PRACTICES/ ATTRIBUTES

Ansari et al., (2013) reported that 87 per cent of the nomad families stay and move together with other families, mostly closely related, to support each other in different occasions. Consequently, the tent settlements of Raen nomads consist of two to six households and build a unit or 'cluster'. They also reported that traditionally, the Raen nomads consume more milk in their diets than meat. In fact, they often express a dislike for killing and trading animals.

Rao et al., (2013) reported that majority of shepherds belong to the Hindu religion (95.33%) and back ward community (75.31%).

Porwal et al., (2006) reported that sheep rearing was traditional occupation for certain specific communities in different parts of India. They further reported that 96.50 per cent of the respondents were Hindus while 3.50 per cent were Muslims and among Hindus, 88.20 per cent belonged to OBC and 11.80 per cent to SC community and in OBC 95.80 per cent were Gujar and 4.20 per cent Jat.

Dev et al., (2003) reported that Gaddis were of robust frame and survive exposure to all extreme weather conditions owing to the migratory life. They also reported that Gaddi families were patrilineal and patriarchal with the father heading the family and representing the family in all the social groups.

2.1.10 LIVESTOCK OWNERSHIP PATTERN

Ansari et al., (2013) reported that male adult family members own most of the livestock, while girls and women do not own any. Dev et al., (2003) also reported that in Gaddi family was patrilineal and patriarchal with the father heading the family and representing the family in all the social groups.

2.1.11 HERD COMPOSITION AND SIZE

Ansari et al., (2013) reported that Siahjel nomads of Raen origin rely mainly on goats but keep a small number of sheep. Average proportions of goats, sheep and equines (mainly mules and a few donkeys) per family are 89 per cent (range 71 to 100), 8 per cent (range 0 to 29) and 3 per cent (range 0 to 27), respectively. Mules and donkeys were kept for transportation. They also reported that adult breeding females constituted 44 per cent, the largest group within the goat herds; the female yearlings made up 12 per cent. Bucks and male yearlings constituted 8 per cent and 7 per cent of the herds, respectively. The high proportion of adult and yearling males (15%) in relation to adult and yearling females (56%) is a disproportionate buck ratio (1:3.6). Contrarily, the proportion of kids and yearlings in the total goat herd is relatively low, which may indicate a low reproductive rate.

Suresh et al., (2011) reported that the average size of sheep holding was 61, ranging from 55 among landless farmers to nearly 70 in large farmers, indicating a positive association between landholding-size and flock-size.

Swarnkar and Singh (2010) reported that in Rajasthan majority of farmers (45.7%) had 50 - 100 sheep in their flock, followed by 39.5 per cent (≤ 50 sheep / flock) and only 14.9 per cent possessed > 100 sheep / flock. Almost similar pattern was found in the semi-arid region, but in the arid region majority (43.9%) of farmers had ≤ 50

sheep in their flock. It was also reported that the adult to lamb ratio in arid and semi-arid region was 0.77:0.23.

Singh et al., (2006) reported that about 46 per cent farmers were small and 54 per cent farmers were large, maintaining 34 and 66 per cent of the total animals, respectively. The average number of animals was 318 on small and 528 on large flocks, with an overall average of 431 animals per flock. The composition of migratory flocks showed rearing of a good number of goats (31%) also, along with sheep. The share of goats was higher on small (35%) than large (29%) flocks.

Porwal et al., (2006) reported that the average livestock holding of sheep, goat, cattle, buffalo, camel and donkey /household were 93.7, 14.3, 2.3, 1.9, 1.2 and 1.7 heads, respectively. The flock composition of sheep in target cluster of villages was constituting 1.38, 66.17, 11.63 and 20.81 per cent of the flock, respectively.

Dev et al., (2003) reported that the tribal economy of the Gaddis is predominantly agro-pastoral with livestock forming the most important possession of the tribal population. They further reveal that the average size of flock was 237, out of which the number of sheep and goat were 128 and 109, respectively. Similarly, the average size of flock size on marginal, small, medium and large holdings was 75, 180, 280 and 413, respectively.

2.2 MIGRATION ASPECTS OF SMALL RUMINANT REARING PASTORALISTS

Ansari et al., (2013) reported that among the nomad families, 81 per cent use the Baft rangelands in spring and summer for grazing and migrate to the southern Persian Gulf provinces of Hormozgan and Bushehr in autumn and winter. These nomadic pastoralist households have no fixed homesteads and cover great distances with their livestock even within the Baft region, following pasture availability throughout the seasons. The other 19 per cent of families show a regular seasonal movement between set areas within the Baft region. These transhumant pastoralists usually stay as a single family and do not integrate with other families.

Rao et al., (2013) reported the existence of 16 traditional migratory tracts in their study area of North Coastal Zone of Andhra Pradesh. It was reported that the mean duration and distance of migration of the 16 sheep flocks were 181.25 ± 0.63 days and 75.87 ± 0.78 km, respectively. The major problems during migration included disease outbreaks (85.95%) and lack of veterinary facilities (83.81%). They also reported that the sheep owners of the North Coastal Zone usually migrate during December to June because of the scarcity of feed and fodder resources in this period and come back after onset of rainy season. The sheep farmers during migration are practicing penning of animals to earn income to meet the livelihood requirements.

Similarly, Suresh et al., (2008) reported that the short term migration of sheep was practiced by 23 per cent farmers in Rajasthan, whereas Shinde and Singh (1995) indicated that in arid and semi-arid regions 86 and 67 per cent of sheep were migratory, respectively. Further, Rao et al., (2013) also reported that the reasons of migration were lack of feed resources, income from penning, traditional practice, successive drought, lack of water resources and lack of sufficient grazing land. They also reported that the sheep flocks during their migration selected the villages wherever grazing resources and hiring charges for penning were abundant and halted for a few days and proceeded to next village, where the above said facilities are available in the same migratory tract.

It was also reported by the same authors that the sheep on rangeland covered an average distance of 6.07 km/day. About 5000 sheep constituted a 'Dang' headed by a Numberdar who is supposed to be an intelligent, experienced and aware man among the lot. It was also evident that the sheep farmers did not follow any fixed route of migration: the route of migration was decided by the Numberdar in consultation with advance survey party to assess availability of feed/fodder/water in the prospective region.

Suresh et al., (2011) reported that the size of the flock influenced the decision to migrate, to avoid competition with smaller flocks which depend mostly on pasture resources of the native place. The other reason was the relative preference for

bearing the drudgeries of sheep migration over income loss arising out of downsizing the flock size suiting to the carrying capacity of the pasturelands. They also reported that sheep farming was highly labour intensive and family size of breeders was often supportive of this extensive system of management under which sheep were predominantly raised.

Swarnkar and Singh (2010) reported that the flocks of semi-migratory type were dependent on climatic conditions and opportunities for availability of feed and water for their animals. They also reported that 90.80 per cent farmer's flock remained on migration from February to the end of June. The route taken for temporary migration of flocks includes maximum towards Dausa-Bharatpur-UP (37.5%) followed by Bundi-Kota-MP (20.8%), Haryana-Punjab (20.8%), Tonk-Swaimadhopur (12.5%), Bhilwara-MP (6.3%) and Sikar-Haryana (2.1%).

Singh et al., (2006) reported that migration was followed throughout the year in the study area, and took place from the native places to the higher altitudes like Dhauladhar, Bharamour, Lahaul-Spiti, Dhawaladhar, etc. during the summer and to the foothills and plains during the winter season.

They further reported that summer migration starts from the months of April-May to higher heights and the flocks start returning during September-October and reach their native places by November. They reported that in the winter, the flocks leave their homes for the foothills and plains in November and graze on crop residues in the harvested fields, natural vegetation on fallow lands, and in the forest areas. They start returning to their native places in the months of March-April. The study revealed that the final destinations and number and duration of halts during migration were not fixed. The study also reported that the flock-owners of the study area were not nomads in the real sense, as only the male members migrated with flocks. The study also revealed that during the rainy season or cold stormy days at higher altitudes, flock-owners faced acute shortage of food, drinking water and shelter. They were prone to pneumonia/nausea disease due to extreme cold and insufficient food. They had to face risk of their lives and their animals' lives, when there was snowfall in the month of August. They had to face some hostile forest officials and local people

during migration. It was also reported that the migratory sheep and goat production is heavily influenced by the status of existing technologies. Nearly three-fourths of the flock-owners felt that the existing breed was poor in wool production. On the other hand, all the respondents revealed that the existing breeds were good/satisfactory in terms of quality of wool, meat yield, meat odour, disease resistance and reproduction.

Porwal et al., (2006) reported that among the respondents covered in the survey, 94.12 per cent resorted to annual migration while 5.88 per cent were sedentary flock owners and among the migrating flock 68.75 per cent resorted to inter-state migration while 31.25 per cent opted for short distance migration within the state. Annual sheep migration in the region is driven by feed, fodder and water scarcity during summer and is a compulsion rather than a voluntary option for the sheep farmers. It was also reported that 27.5 per cent of the migrating flock owner moved with their family *en route* migration and women and children mostly remained the base camp (Dera) to look after food need of the family and care of newborn lambs. It was further reported that majority of the sheep farmers initiated migration in the month of November (58.75 %) and December (37.50 %) and lesser number of farmers migrated during February (3.75 %). The sheep farmers returned from migration to their native tract mostly in the month of June (17.50 %), July (58.75 %) and August (23.75 %), which in turn was dependent on onset of monsoon and distribution of rainy season in the region. It was evident that on an average the sheep farmers surveyed remained on migration for seven months of a year.

Saravanakumar (2003) in a benchmark survey on the migratory pattern of Nellore sheep identified 8 major (above 90 km distance) and 10 minor (below 90 km) migratory tracks in Nellore and Prakasam Districts of Andhra Pradesh. The average days of migration in the identified tracks were 91.38 ± 8.04 to cover a distance of 84.03 ± 6.33 km. During migration the sheep flocks depend mainly on common property resources like community grazing lands including permanent pastures, uncultivable and cultivable waste lands, fallow lands, and village forests. Dixit et al., (2005) reported that the Gaddi tribes in Jammu and Kashmir owning Rampur Bushair sheep followed migration during summer months. Rajapandi (2005) also

reported that most of the flocks (92.50%) of Coimbatore sheep migrated in all directions depending on availability of grazing lands and harvested paddy fields with a migratory distance of approximately 100 to 200 km.

2.3 MANAGEMENT PRACTICES FOLLOWED IN MIGRATORY FLOCKS OF SMALL RUMINANTS

2.3.1 FEEDING

Ansari et al., (2013) reported that while 38 per cent and 31 per cent of herds are grazed on open or bush/shrub grassland, 23 per cent and 8 per cent of herds are grazed on tree-covered or stone-covered grasslands. Nomads do not own or rent any land but use communal grasslands. Of the goat herds, 67 per cent were grazed separately and 33 per cent were grazed together with sheep. The herders explained that tree-covered grazing areas which include wild oak trees were the preferred rangeland, as the nutritive value of leaves consumed by animals complements the grass very well. They also reported that 36 per cent of the herds receive water from wells, while the other herds are supplied with water from various sources such as rivers, pipes, springs, rain and small dams. While only 4 per cent of herds have access to water directly at the grazing rangeland, the majority of nomads (72%) supply their animals with water at a distance of up to 5 km. Most herd owners water their animals twice (71%) or even three times daily (24%). It was further reported that the Goat bucks, does, yearlings and kids are supplemented with barley mainly during the winter season when feed is scarce in rangelands. Relevant feed types used to hand feed animals include crop by-products, straw and hay, grains and vegetables. Wheat and barley straw, and bran were the most commonly fed crop by-products. Sedentary farmers allow the nomads to graze their herds on the crop stubble left in the fields or in the orchards. This agreement provides food for the nomads' livestock while providing manure to fertilize the farmers' fields and orchards. Further it was also revealed that the rangeland was considered the main

source of livestock nutrition (85%), while grazing crop stubbles contribute about 15 per cent to the livestock food source. Stubble fields were mainly available in autumn.

Rao et al., (2013) reported that the average grazing time (h) and grazing distance (km) were 8.48 ± 0.06 and 6.02 ± 0.17 in summer and 6.08 ± 0.05 and 3.78 ± 0.03 in seasons other than summer and these findings were also comparable with the reports of Rajapandi (2005), Kandasamy et al., (2006) and Kumar et al., (2006).

Swarnkar and Singh (2010) reported that during summer months, majority of the flocks (60.0%) were taken for grazing in field / forest between 6.00 AM to 8.00 AM. In monsoon season, usually flocks (48.5%) were taken for grazing after 9.00 AM depending upon the weather conditions. They also reported that majority of farmers were observed to adopt mixed grazing by maintaining a few numbers of goats in flock. The proportion of farmers adopting mixed type of grazing ranged from 61.15 per cent (semi-arid) to 88.2 per cent (arid) with an average of 71.1 per cent. The overall picture on grazing resources for sheep flocks exhibited that majority (84.8%) met their nutritional requirement on community grazing land / forest, top feed and on-farm waste. The practice of rotational grazing can reduce the reliance on anti-helminthic interventions (Singh and Swarnkar, 2005) particularly during February (when flocks are usually grazed on stubbles in post-harvested fields) and June (when most of dry matter intake was from top feed).

Porwal et al., (2006) reported that during migration the sheep farmers mostly used community rangeland (92.94 %), cropped land after harvesting of standing crops (70.59 %) and forest land (97.65 %) for grazing sheep while road side grazing (27.06 %) and other area grazing (4.71 %) was used to some extent. A total of 88.24 per cent respondents used mixed grazing while only 11.76 per cent used livestock grazing as separate flock. The above authors also reported that the farmers on an average employed 6.9, 7.8 and 8.0 hrs grazing period/day during rainy, winter and summer season, respectively.

Singh et al., (2006) reported that the adoption of improved feeding practices was poor in the study area. The flock-owners reported that they did not feed concentrate, feed supplements and vitamins to their animals. Further, they did not feed roughage

to their animals when fodder availability was poor, especially during the winter season. However, common salt was regularly fed to the sheep. Further their study also reported that there was poor fodder availability at native place as well as en-route migration at lower hills and in plains, although response about grazing land was satisfactory. Responses were good /satisfactory about availability of fodder en-route migration at higher altitudes.

Katoch and Kumar(2005) reported that the tribal of Lahaul valley were managing their small ruminant under cold desert conditions due to heavy snowfall by keeping animals (sheep and goat) inside houses and were stall fed. The animals were fed with branches of Salix tree, crop residues (barley straw, pea straw), and local pasture grasses along with feeding of grains like barley. During summers (April-September), sheep and goats were taken out for grazing on common lands.

2.3.2 BREEDING

Ansari et al., (2013) reported that goats are most frequently mated in late June/July and kidding takes place at the end of November till January. The kidding period at the beginning of winter is associated with low temperatures and low feed availability in the rangelands of Baft area.

Rao et al., (2013) reported that the mean lambing per cent in the study area was 81.33 with a range of 78.56 to 83.52. Similarly Kumar *et al.*,(2006), Kandasamy *et al.*,(2006), and Mishra *et al.*,(2006) also reported lambing per cent of 77-78, 60-95, 82.4 and 86.99 per cent, respectively. The mean twinning per cent in sheep observed in the study area was 0.48 with a range of 0.30 to 0.62. This was in tune with the findings of Raman *et al.*, (2003), Mishra *et al.*,(2004) and Kandasamy *et al.*,(2006) who reported twinning per cent of 1.06, 0.5 and 1.10, respectively. Further it was reported by same authors that the mean $\pm$ SE values of age at first mating (months) in ewes from the three districts ranged from 12.33 ± 0.10 to 13.66 ± 0.10 with an overall mean $\pm$ SE value of 12.85 ± 0.10 in the North Coastal Zone. The age at first mating in females reported by other workers in different breeds ranged from 10-24 months (Kushwaha *et al.*, 2007, Mishra *et al.*, 2004, Kumar *et al.*, 2006 and Kandasamy *et al.*, 2006). Breed and nutritional status of the animal might be the

reason for the differences in age at first mating in ewes. The mean $\pm$ SE values of age at first mating (months) in males in the three districts ranged from 19.48 ± 0.07 to 22.51 ± 0.07 with an overall mean $\pm$ SE value of 21.17 ± 0.07 in the North Coastal Zone. The age at first mating in rams reported by other workers ranged from 10 to 24 months in different breeds (Jagatheesan, 2001, Dixit *et al.*, 2005, Kumar *et al.*, 2006, Kandasamy *et al.*, 2006 and Kushwaha *et al.*, 2007). The mean age at first lambing in the study area was 17.75 months which was comparable to the findings of Kumar *et al.*, (2003), Mishra *et al.*, (2004), Kumar *et al.*, (2006), Kandasamy *et al.*, (2006) and Poonia (2008) who reported age at first lambing of 15-18, 16-20, 16.49, 16.60 and 17.5 months, respectively. Regarding mean lambing interval Rao *et al.*, (2013) reported that in case of sheep in the study area it was 9.70 months. The presented findings were comparable with that of Nimbkar *et al.*, (2002), Sahana *et al.*, (2004), Kumar *et al.*, (2006), Kandasamy *et al.*, (2006) and Poonia (2008) who have reported mean lambing interval of 10, 8.8, 6- 8, 7.7 and 8.25 months, respectively.

Suresh *et al.*, (2011) showed that the sheep farmers were sensitive to the suitability of the breeds for migration. The native *Marwari* breed is known for good walking capacity for long distances which is a desirable attribute for migration. *Malpura* another sheep breed was endowed with better body weight compared to *Marwari* breed. In order to exploit better walking ability of this breed combined with higher body weight of *Malpura* breed, the farmers developed and popularized crossings of *Malpura* and *Marwari* breeds known as *Kheri*. They reported that *Kheri* breed was more popular among the migrating breeders and was owned by 86 per cent of them.

Swarnkar and Singh (2010) reported that the overall average annual lambing in field flocks of Rajasthan was 78.5 ± 0.7 per cent. The frequency distribution revealed that in majority (47.8%) of flocks the annual lambing remained between 50 to 80 per cent followed by 44.7 per cent flocks with > 80 per cent annual lambing. It was also reported that in field flocks lambing occurred throughout the year but majority of ewes were reported to have seasonality in lambing. Around 75 per cent of flocks had lambing period at the end of monsoon (usually September-October) while around 24 per cent during winter (November to February).

Singh *et al.*, (2006) reported that the animals were mostly bred when migration from the alpine pastures begins during September-October, so that lambing takes place during February-March.

Porwal *et al.*, (2006) reported that the lambing rate on farmers flock averaged to 80 per cent during major lambing season (February- March) and 40 per cent in minor lambing season (September- October). Accordingly 90.59 per cent of the respondents indicated that they harvested three lamb crops in two years while 9.41 per cent harvested only one lamb crop/year.

2.3.3 HEALTH CARE

Ansari *et al.*, (2013) reported that disease; predators and poisoning accounted for 57 per cent, 36 per cent and 5 per cent of adult animal deaths, and only 2 per cent of deaths were for unknown reasons. Disease, predators such as wolves and jackals, and accidents accounted for 88 per cent, 11 per cent and 1 per cent, respectively, of young animal deaths. Such uncontrollable loss of animal changes from year to year, causing growth and decrease in herds in a typically unstable manner (Goldstein and Beall 1990; Miller 1998, 2000). They also reported that among the losses of young animals caused by diseases, the most prevalent diseases were diarrhoea (58%), pneumonia (40%) and foot-and-mouth disease (2%), and the most prevalent diseases among adults were enterotoxaemia (49%), foot-and-mouth disease (26%), pneumonia (23%) and agalactia (2%). They further reported that adult male goats tend to have lower rate of losses. Of all adult goat losses, 67 per cent were females and 33 per cent were males. It is well documented that mortality rates of females, especially lactating animals, increase during drought periods (Stroebe *et al.*, 2008).

Rao *et al.*, (2013) reported that the morbidity losses result in low productivity of the animals. Existing veterinary services for prevention and control of diseases in goats in the rural areas were inadequate. Livestock services available to small holder goat keepers were biased towards delivering curative veterinary services. Preventive veterinary care receives less attention, and vaccination coverage of animals was below the level of effective protection (Ahuja *et al.*, 2000). Because of the increased

vulnerability of diseased animals, preventive care becomes more important, particularly in small ruminants.

Suresh et al., (2011) reported that veterinary health care provided by Government in the study area was very poor and the migratory sheep breeders were dependent on the service of private veterinarians. Majority of the farmers were reported doing self-treatment of the animals and also the treatment based on the advice of the salesman of the medical store.

Singh et al., (2006) reported that at higher altitudes, veterinary facilities were reported to be very poor by almost all the flock-owners. However, at native places, foothills and plains, it was ranked satisfactory by about half the respondents. It was reported in the study that morbidity rates were severe (15-25%). However, mortality rate was reported to be low at foothills/plains (2-3%) and higher altitudes (4-6%).

2.3.4 GENERAL MANAGEMENT

Ansari et al., (2013) reported that the animals which were diseased were kept at the family tent, effectively isolated from the herd, so chances that infection will spread throughout the herd were thus reduced. It was also reported that the nomads also keep large, fierce Choupan (shepherd) breed of watch dogs for protection of the family and the herd.

Singh et al., (2006) reported that the dogs were maintained to guard the sheep and goats from wild animals, especially at the higher altitudes. Horses and mules are also kept for transportation purposes.

2.3.5 SHEARING

Swarnkar and Singh (2010) reported that the farmers of Rajasthan sheared their sheep 2-3 times in a year.

Singh et al., (2006) reported that the shearing of wool was practiced during April-May and October-November at home only. They also reported that the existing medical technology was found to be appropriate as sixty-five per cent of the total flock-owners responded that the existing medicines were effective in the treatment of animals.

2.3.6 IDENTIFICATION

Islam (2001) reported in his study that although many pastoral families migrate together; herds from different families never mix or get lost during migration. A Fulani man can identify his animal by its name, color, hair, spots, patches, twist of the horn, footmarks, or shape of breast.

2.3.7 DEWORMING

Rao et al., (2013) reported that 47.39 per cent of the farmers followed deworming at 6 months interval. It was also reported that 10.20 per cent of the sheep farmers have not practiced any deworming.

Swarnkar and Singh (2010) reported that in Rajasthan under field conditions, the measures taken to protect their animals from ectoparasites were very meagre and dusting with insecticide was practiced by a few numbers of farmers (18.8%). They also reported that drenching against internal parasites in field flocks was mainly done after shearing. The usual months for anthelmintic drenching were February, June and September in semi-arid region and February-March, June and September - October in arid region. It was reported that the majority of farmers (71.5%) resorted to select anthelmintic either using their own wisdom and experience or depends on the advice of local chemists revealing very limited liaison between veterinarian and farmers.

2.3.8 VACCINATION

Rao et al., (2013) reported that sheep flocks were vaccinated mainly against Enterotoxaemia (87.60%) followed by Foot and Mouth diseases (71.87%), Pestides petitis ruminants (67.18%), sheep pox (43.54%) and Anthrax (10.31%). It was also reported that 12.7 per cent of the sheep farmers have not practiced vaccination at all. The findings were well in reported by other workers like Rajapandi (2005) who reported that Coimbatore sheep flocks were also vaccinated against these diseases.

Swarnkar and Singh (2010) reported that the farmers were well aware of vaccination practices against the important diseases like enterotoxaemia (ET) and sheep pox. However, adoption of health measures varied from zone to zone

depending upon the occurrence of diseases in past, availability of vaccines and other resources. In all the zones anthelmintics were extensively used to control the internal parasites.

Singh *et al.*, (2006) reported that the vaccination was reported to be satisfactory or good by all the respondents. Although, adoption of improved medicine was satisfactory, it was observed that flock owners generally vaccinated their flocks after the incidence of diseases.

2.3.9 CASTRATION

Ansari *et al.*, (2013) reported that the surgical technique of cutting the scrotum open with a knife and pulling the testicles is the common method of castration. The animals are usually castrated within their first year of life, often by six months of age. Nomads castrate their animal during the cool months of the spring and autumn to reduce the chances of infection being spread by flies and other insects.

Chandra *et al.*, (2005) conducted their study among the Tribal goat keepers in Terai belt of West Bengal and reported that the various management practices like castration by castrator, use of medicine during illness, deworming, colostrum feeding and vaccination against diseases were respectively adopted by 81 per cent, 41 per cent, 30 per cent, 13 per cent and 4 per cent.

2.3.10 HOUSING

Ansari *et al.*, (2013) reported that adult and young livestock are penned separately near the tent in circular-shaped pens made up of wood and fenced overnight, and they are milked by women and children in the morning before being taken out for grazing.

Rao *et al.*, (2013) reported that majority of sheep farmers have provided night penning in closed pattern type of house under kutcha housing with kutcha flooring and 93.22 per cent of sheep houses in the Zone were poorly ventilated. Sheep penning had the advantage of housing as well as manuring the land at a cheaper cost than the closed type of housing.

Sharma *et al.*, (2007) also reported that 82 per cent of goat rearers of Rajasthan provided Katcha flooring type of house. Similarly, **Sahana *et al.*, (2004)** observed poor sanitary conditions in the housing of Jalauni sheep.

Porwal *et al.*, (2006) reported that the animals grazed in 3- 4 km radius of the base camp and herded for night sheltering in the Dera under open sky.

2.3.11 WEANING

Rao *et al.*, (2013) reported that the mean weaning period of sheep in the study area was 3.25 months. Weaning is influenced by sex of the lamb and demand for sale. They further reported that the mean weaning per cent in the study area was 85.53.

2.3.12 LAMB AND KID REARING

Ansari *et al.*, (2013) reported that during average years with sufficient fodder, many nomads do not want to sell their animals as they believe in maximising the number of animals owned as a safeguard against losses. Further they also reported that the newborn and young animals were often kept together at the tent with the women and children until they were old enough to go out to pasture with the herd. When young animals were still nursing, the herd returns to the tent at least once each day to allow them to nurse.

Swarnkar and Singh (2010) reported that majority of farmers (54.0%) kept lambs in corral up to age of 2 months and mix them with flock at the age of 2.39 ± 0.04 months for grazing with adult stock. In semiarid region the average age of lambs at first grazing was significantly lower (2.20 ± 0.05 month) compared to arid region (2.72 ± 0.07 month). It was also reported that during March-April, lambs were allowed to graze first time with adults on stubbles available in post-harvested field.

2.4 MARKETING PATTERN OF SMALL RUMINANTS AMONG PASTORALISTS

Ansari *et al.*, (2013) reported that the price of live animals is usually determined by the sex, size and condition of the animal, although due to lack of a marketing infrastructure in the nomadic areas, nomads feel that they were subjected to lower

prices offered by the buyer. Animals were sold to abattoirs or butchers directly either for cash needed for income or for culling unwanted livestock. Meat production is almost exclusively for sale. Home slaughtering for own consumption and sales to neighbors or relatives occurs only occasionally; hide sales therefore play a minor role for income. It is further reported that on an average, 41.00 per cent of animals were sold because they are too old, while 39 per cent of animals were sold based on their health condition and lack of feed availability in different seasons. Only 20.00 per cent of animals were sold because the herd is overpopulated. It was also revealed in the study that nomadic goat pastoralists in Baft were more commercially oriented than nomads in other parts of Iran, as cashmere, milk and meat were given more priority for production than animal breeding and social status. It was also reported by the same researchers that the Goat coarse hair was spun and woven into tent material, ropes and blankets. The raw cashmere is usually sold to dealers and sometimes dyed using natural dyes and spun into items for home use using different spinning wheels and drop spindles.

Suresh et al., (2011) reported that the major items providing return were sale of live animals, wool, milk and manure. The live animal sale had the lion's share (78%) in total returns. The sale of wool, milk and manure together accounted for 22 per cent in net returns.

Dev et al., (2003) reported that the sale of wool and meat contributes significantly to the family income. Wool production per animal varied from 1.0 to 1.50 Kg/animal/annum in two shearing. The grazers sell about 15 per cent of the animals each year for meat purpose.

Swarnkar and Singh (2010) reported that the overall average age for disposal of adult sheep and lambs in farmer's flocks of Rajasthan was 86.7 ± 0.8 and 5.1 ± 0.1 months, respectively. It was found that age for disposal of surplus animals remained marginally lower for both adult and lambs in semiarid region than in arid region. Further it was reported that among the sheep farmers in Rajasthan, majority (56.5%) disposed adult animals after 84 months of age while 77.30 per cent of farmers sold

surplus lambs after 3 month of age. However, in semi-arid region slightly higher proportion of farmer sold their lambs before 3 month of age.

Singh *et al.*, (2006) reported that the marketing facilities for live animals, meat and wool were rated very poor at higher altitudes. These were poor at native places, foothills and plains also, except for live animals. The processing facilities were reported to be very poor. The prices of wool, live sheep and goats were rated poor/very poor by all the respondents at higher altitudes and poor by 62 per cent respondents at the native place and foothills/plains. It was also reported that the transportation infrastructure was found very poor at higher altitudes and satisfactory at foothills and plains.

Porwal *et al.*, (2006) reported that earlier the farmers used to dispose off their surplus male lambs at 9- 12 months of age weighing 22- 23 kg (Karim, 2004) while the changed scenario of continuous drought in the region compelled them to dispose off these lambs at an early age before starting migration (Singh *et al.*, 2003). It was reported that the sheep farmers were to sell off the male lambs at 3- 4 months of age weighing about 17- 18 kg, which is a colossal wastage of animal resources.

2.5 PROBLEMS IN SMALL RUMINANT REARING AMONG PASTORALISTS

2.5.1 EN-ROUTE PROBLEMS DURING MIGRATION

Rao *et al.*, (2013) reported that the problems faced by the sheep farmers due to migration were disease outbreaks, lack of veterinary facilities, lack of shelter, improper care of lambs, problem of predators, abortions due to stress, theft and restrictions of entry of animals in migratory paths.

Suresh *et al.*, (2011) reported that the most important en-route problem was 'increased morbidity of the sheep flock' during migration, reported by 96 per cent of the farmers, followed by 'non-availability of proper veterinary medicines' (about 75% farmers), resistance from local farmers (64% farmers). Other major constraints were loss of livestock due to theft and missing, mental tension of the migrant farmers due to long distance travel, separation from the family, drudgeries during travel and

insecurity in the remote villages. Lack of marketing and healthcare facilities during migration and harassment by the officials concerned with the restriction of the pastoralists were also important en-route problems faced by the farmers.

Singh *et al.*, (2006) reported that the wild animal attack was reported to be a severe problem at higher altitudes by 70 per cent of flock-owners. They opined that about 8-10 per cent of the flocks were killed by the wild animals.

Porwal *et al.*, (2006) reported that the major problems faced by sheep farmer's en route migration were restrictive rules and regulation (66.25 %), resistance by local farmers (63.75 %), lack of graded breeding rams (80.00 %), lack of veterinary health coverage (95.00 %) and lack of proper marketing for animal produce (53.75 %).

2.5.2 PROBLEMS IN PASTURES

Jianshuang *et al.*, (2012) reported that the species richness and diversity were mainly driven by growing season precipitation (GSP), which accounted for over 87 per cent of the total variation observed. Species richness and diversity at grazing excluded and freely grazed sites appear to respond to growing season precipitation in parallel. Species richness exponentially increased with GSP while diversity indices showed positively linear relationships with GSP. Generally, overgrazing results in grassland degradation, with good grasses declining and poisonous plants increasing due to selective grazing behaviour and trampling by livestock. Grazing exclusion is a prevalent manner adopted in protecting natural grasslands all over the world (Osem *et al.*, 2004; Yeo, 2005; Holechek *et al.*, 2006; Osem *et al.*, 2006; Mayer *et al.*, 2009). However, experiments indicate that long-term livestock grazing exclusion may not necessarily increase species richness in less productive systems (Oba *et al.*, 2001; Schultz *et al.*, 2011) and even could result in a decline in species richness due to differences in the competitive dominance of species (Tilman 1997; Tilman *et al.*, 1997). Optimal grazing exclusion could improve species richness and evenness in degraded grasslands (Li *et al.*, 2009; Zhao *et al.*, 2011). A few ecologists have argued that grazing exclusion has no effect on the richness of native or exotic species but significant impacts on species composition (Lunt *et al.*, 2007; Mayer *et*

al., 2009). There is still no consensus on how grazing exclusion affects plant species diversity (Zervas,1998; Oba *et al.*, 2001; Deleglise *et al.*, 2011; Schultz *et al.*, 2011).

Porwal *et al.*, (2006) reported shrinkage of grazing lands as one of the main problems faced by sheep farmers. They reported that majority of sheep farmers ascribed shrinkage of grazing land to encroachment by villagers (97.33 %) and erection of permanent structures by villagers (80.00 %) as main reasons, while land reclamation for conventional agriculture (36.00 %), government allotment to weaker segment of society (32.00 %) and construction of water harvesting structures (57.33 %) were other important reasons for shrinkage of grazing land.

Rao *et al.*, (2013) reported that the major factors such as disease attacks, shrinkage of grazing lands, high lamb mortality, exploitation by middlemen, labor shortage, lack of government schemes as major constraints in small ruminant rearing.

Shankar *et al.*, (1996) reported that the high grazing pressure, palatable grasses and legumes do not get sufficient time for seed setting and dispersal. Meanwhile undesirable plant species, which are not grazed, get conducive conditions to thrive and set seed. This unchecked growth of weeds has led to their dominance in most of the pastures.

2.6 LIVELIHOOD SECURITY OF PASTORALISTS

Manoli *et al.*, (2014) stated that accumulation of a stock of living animals is a major means of livelihood security that pastoralists use to cope with their constraints, amongst which is high environmental variability. Diversification and long distance mobility are other means of livelihood security, implying specific family organization. Herds were the major means of livelihood security, but due to lack of a sufficient labor and other assets, the situation of these impoverished families was very precarious.

Jennifer (2013) stated that pastoralist communities face many challenges to their livelihoods, including poor access to health and educational services. Their mobility can prove as an obstacle for enrolments and registrations. Sedentarisation is a growing phenomenon that is changing the social fabric of these communities. With

these changes new challenges arise such as the loss of livestock and the need to find alternative cash incomes for sedentary living. Although many feel the benefits of sedentary lifestyles, including better access to schools and clinics, others worry that age-long traditions, knowledge and skills of the nomadic people will be lost.

Isah (2012) reported in his study that the Fulbe pastoralists perception on the sources and degree of vulnerability in their system. According to him first and foremost, the greatest threat to Fulani livelihood is nothing other than the insecurity of the cattle due primarily to prior accessibility to pasture land and water points. This is followed by cattle diseases. Clashes between farmers and pastoralists in Northern Nigeria are ubiquitous and on the increase.

Nkurumwaet al., (2012) reported that the most of the Maasai agro-pastoralists of Narok North District have largely succeeded in adjusting the social and cultural aspects of their lives to agro-pastoralism, and these aspects appeared not to present significant challenges to them. The most pressing challenges were economic, technical and environmental in nature. These challenges can form intervention points for development partners to help the Maasai be more effective in agro-pastoralism. There is need to discard the stereotype about the Maasai not being able to effectively engage in crop cultivation due to their strong pastoralist background. Given the right support, they can fully exploit the benefits of agro-pastoralism and contribute significantly to food security in their community and even beyond.

Yazan et al., (2012) reported that the number of livelihood sources, household size, distance to the nearest market, ownership of enclosures and household herd size were the most influential factors that determined poverty among agro-pastoral communities. The number of livelihood sources, education level of the household head, relief food, extension service and distance to the nearest markets were positively related to per capita daily income. A negative relationship was observed between per capita daily income and household size. Since poverty shows declining with positive influential factors, reduction of transient poverty can be achieved

through enhancing and providing of livelihood alternatives to reduce over-reliance on livestock and land as primary sources of livelihood.

Shem (2012) reported that pastoralism in Tanzania is under threat from the effects of human settlement and state encroachment in favour of wildlife conservation all which are increasingly forcing pastoralists off their traditional lands. Other pressures include poor infrastructure, hostile market mechanisms and unfavourable government development policies. Most public policies do not actively support adaptation mechanisms that allow sustainable development of rangelands and are generally hostile to pastoralism. As a result, pastoralists are faced by poverty due to the negative effects of climate change like droughts and unusual rainfall patterns all which increase conflicts over dwindling natural land resources.

Nusrat et al., (2011) reported that with the decreasing pasture land, disturbed migratory routes, decline in Jajmani rights, restriction of access to forest resources, enclosure of forests, expansion of irrigated agriculture, breakdown of village institutions, deterioration of pasture and common property resources etc, the Van Gujjars face severe problems and challenges for their livelihood security. They further reported that in Uttarakhand the growing population trend in Himalayan hills has forced the people to convert forest and common lands into crop or horticulture production. Expansion and Intensification of crop farming and increasing horticulture (apple orchards in particular) has affected the pastoral migratory routes. Apple orchards are increasing in number on open hill slopes and fenced with stone walls. Some of these open slopes had been used by the Van Gujjars for camping due to good sunshine to cope with cold weather. Now the Van Gujjars are compelled to camp inside nearby forests. The colder forest microclimate is harmful for the livestock. Apart from that the distance between two consecutive camping sites has been increased two to three times at some places due to the deletion of one camping site. However, this situation has been taken up by the Van Gujjars as opportunity for better survival by seeking for employment in the apple orchards as daily wagers for extra income supplementation. It is also reported by Nusrat et al., (2011) that when Livestock is barred from entry to protected areas, there is often very high growth of grasses, regularly leading to forest fires. Local people know that

grazing animals control the growth of grass, so preventing the spread of fires. Local people also know that livestock browsing stimulates trees to branch, leading to denser and more luxuriant top growth. Further on, browsing leads to dispersal of seeds by being carriers through their skin. Henceforth, migratory Van Gujjar's livestock also play an important role in the dispersal and germination of seeds and scatter their feces in the process in a dispersed manner, thus contributing to plant biodiversity.

Brocklesby et al., (2010) stated in their study that pastoralist livelihood security is characterized by 'competence': the capacities, capabilities and agency required to build up and manage assets; make demands, secure and give support, adapt to changing conditions and maintain wellbeing.

Fabusoro and Oyegbami (2009) states that the asset assessment shows that Fulanis have unsecured livelihoods due to unsecured access to grazing resources. Poor access to land for grazing and water inadequacy were perceived as major sources of livelihood vulnerability. Reduction of Fulanis' vulnerability through secured rights on land, enhancement in the efficiency of existing livelihoods, improvement in livelihoods asset are imperative for livelihoods security.

Fabusoro and F Hoi Yee (2009) in Nigeria had shown that the livelihoods pattern of the Fulanis reveals a change from Prominent cattle rearing (pastoralism) to crop production (agro-pastoralism) as a response to property right systems, incessant conflict resulting from cattle grazing and livestock mobility, drought resulting in adequate water and grassland and deforestation leading to loss of biodiversity. They further suggested that there is a need for the political intervention to address pastoral neglect and marginalization which has become germane in securing their livelihoods. Mobility is therefore both an ecological and economic necessity for herders as it allows coping with low net primary productivity, high resources variability and the unpredictability that characterizes arid and semi-arid environments. It hinges critically upon technical as well as socio-political factors, as both human and social capitals are critical in ensuring mobility for pastoral communities.

Singh (2008) reported in Uttranchal and Himachal Pradesh that with the decreasing pasture land, disturbed migratory routes, decline in Jajmani rights, restriction of access to forest resources, enclosure of forests, expansion of irrigated agriculture, breakdown of village institutions, deterioration of pasture and common property resources, etc. were the severe problems and challenges for their livelihood security of the respondents.

Kejela et al., (2007) stated that disease, drought, damage to the environment, and rising costs of relocation are forcing pastoralist communities to become more sedentary, but with scant options for alternate income sources. Livestock represent nutrition, food security, and liquid assets and has been the traditional foundation of these communities. Further it is stated that the falling productivity and increasing volatility associated with livestock production is the single largest contributing factor to the poverty in the region.

Fratkin et al., (2005) reported that pastoralists traditionally associated livestock with wealth and regarded those without livestock as being poor and subsequently look down on them. Pastoralism however, is facing increasing pressures. These include; the effects of climate change, increasing population pressure, decreased pastureland and increasing sedentarisation. Pastoralists are increasingly settling, both in response to 'pushes' away from the pastoral economies, represented by the pressures on pastoralism, and to 'pulls' of urban or agricultural life .

Nori et al., (2005) the physical assets are vital to the livelihoods of Fulanis in ensuring the integration of remote settlements to other urban and sub-urban areas which provide for alternative and complementary resources such as health care, market exchanges, cereals, water, among others, especially during critical times. They further showed that the livestock is the pastoralists' fundamental means for the production, storage, transfer and transport of food, wealth and other services. As such it is fundamental to their perception of the security of other forms of asset. Any threat to livestock-such as lack of grazing materials, water, raiding, price variation and disease-is therefore a direct threat to pastoral livelihoods. Nori et al., (2005) further reports that social capital is traditionally strong and important among

pastoralists, in that it minimises risk, enables common resource management and provides safety nets in times of crisis.

According to Bonfiglioli (1993) there are advantages and challenges associated with agro-pastoralism. It offers a refuge and a survival choice during times of drought by ensuring that pastoralists have food reserves to see them through periods of drought. It also widens the sources of income and contributes to risk reduction. One challenge is that crop cultivation among pastoralists introduces in each system new constraints and a new way of life. The adoption of agro-pastoralism by the Maasai therefore, involves not just changes in economic activities, but also adjustments in related non-material social and cultural aspects of their lives.

According to William F. Ogburn's Theory of Cultural Lag, non-material aspects of culture are more difficult to change than material aspects, and may therefore present greater challenges in the adoption of agro-pastoralism by the Maasai.

According to John Mc Intire, Deputy Director General— Integrated Sciences, at the International Livestock Research Institute (ILRI), opined the following risks associated with the pastoral livelihoods in the summits organized on 'The future of West African pastoralism' which include low growth sustainability are high risks caused by rainfall variability, animal disease, and markets; periodic droughts which disturb long term growth of herds, destroying animal capital and forcing herders to restock. However, the risks of pastoralism now appear to be less of a threat to pastoral livelihoods today than in even the recent past because of higher non pastoral incomes (which provide diversification), better communications and cheaper transport. He further suggested some measures to be taken for improving the livelihood security of the pastoralists which includes (1) Building pastoral assets. (2) Create social capital for pastoral peoples. (3) Promote complementary private investments.

Bruijin and Dijk (1995) and Nori et al., (2005) have assessed the sources of vulnerability in Fulbe pastoral system and showed that both the sources they control (animals) and do not control (land, water, market, politics) have direct and significant impacts on their livelihoods and the host communities.

2.7 OPPORTUNITIES AND CHALLENGES IN SMALL RUMINANT REARING

According to United Nations Environment Programme (2014) report the emerging issues of the pastoralists are Land grabbing for conservation, biofuel production, large scale agriculture, mineral extraction, and other activities, and Demographic changes affecting the pastoralists around the world in different ways. In many African countries a growing pastoralist population is surviving on a declining resource base as herd sizes have remained the same and the total available land area has declined. Besides this Climate change was another important issue. It also documented that the solutions can focus on enabling sustainable pastoralism on healthy rangelands to provide a significant share of livestock products in local and international markets. Investment in enabling sustainable pastoralism will rest upon the following six pillars:

1. Providing sustainably-derived technologies for the provision of basic services that are appropriate to the production systems of pastoralists, including renewable energy, mobile health and veterinary services, long distance schools and communications, and safe water for humans and animals;
2. Recognizing land and natural resource rights by legally protecting collective and private rights to manage grazing areas, water sources and livestock movement corridors, wildlife management, risk management and resilience, and enabling land use planning and ecosystem management by pastoralists
3. Building equitable value chains and market access that provide economic opportunities to pastoralists through information, diversification, certification, niche markets, payments for ecosystem services, sustainable tourism, and local and sub-regional marketing infrastructure;
4. Empowering pastoralist institutions and systems through respect for indigenous knowledge and breeds, enabling knowledge sharing and networking, professional certification of herders and shepherds in sustainable management, and ensuring Free, Prior and Informed Consent;

5. Enabling fiscal policies and fair trade by creating a more level playing field with other sectors in which subsidies are fair, tariffs are levied for environmental costs of different sectors, and banking, credit and insurance are available;
6. Promoting awareness of consumers and producers that respects the environmental values of rangeland biodiversity, genetic diversity of breeds, the cultural values of pastoralism and the health benefits of pastoral products.

Gebeyehu *et al.*, (2013) showed that the major challenges to goat production were severe feed shortage, high disease prevalence, high predatory, poor market, genetically less productive breed, severe water shortage and high shortage of laborer. It was also reported that the climate change was affecting and challenging the life of farmers and the pasture production potential was declining because of it which is also supported by the work of Solomon *et al.*, (2010). The opportunities included availability of highly valuable goats in pastoral and agro-pastoral communities in the study area, which are highly adaptive to harsh environment. Further it was reported that goat have great role in reducing unnecessary expansion of bushes and shrub by browsing on it and in turn maintaining the equilibrium of the nature in pasture lands. Great opportunities exists for goat production and productivity improvement in surveyed administrative districts, in which the environment was still conducive and animal productivity can be improved by improved management.

Wakhungu *et al.*, (2012) reported that the important challenges faced by the pastoralists in Kenya and Tanzania were limited access to quality veterinary services where government veterinary offices are more 5 km away to majority (71 %) of the respondents. Opportunities for the pastoralism included the high demand for tasty animal protein from pastoral areas because of Increase in human population within the region, Weekly animal market days within major Townships in pastoral areas offers constant thriving marketing avenues. Since less than one per cent of pastoral farmers are selling their milk to processors and only 15 per cent sell to milk vendors, so there is an opportunity for processing and value addition. Further good political will in country governments to invest in livestock is an added opportunity. Further it

was also stated by the researchers that the Diversification of economic activities with more focus on marketing of other livestock products (e.g. manure, hides) will significantly reduce over dependency on sale of live livestock. It is also reported that the encouraging of public-private partnership investments in the animal health sector within the pastoral areas to increase capacity will be of great value for the upliftment of the pastoral poor people.

Smith (2012) stated in his policy briefing on pastoralism that the government policy-making tends to favour sedentary populations and marginalise pastoralist communities, many of which are threatened by drought, fragmentation of their grazing lands, restrictions on mobility and poor access to basic services. He further put forward that Governments should introduce policies which help to secure and protect pastoralists' livelihoods and Protect pastoralists' rights to land and water and help them to secure their assets and encourage value-adding and diversification. Greater efforts should be made to empower pastoralists and involve them in policy-making. Governments should increase their investments in essential services for pastoralists including education, health and ICTs.

Mohammed (2011) reported in his study in Somalia region of Ethiopia that the main challenges faced by the pastoral communities were poor infrastructure & communication network, poor financial resources, shortage of skilled manpower & facilities, poor trade and marketing policy besides droughts, shortage of rainfall and degradation of rangelands and depletion of pasture. He also reported shortage of teachers & low quality of the existing ones as one of the challenges in education sector. The opportunities reported were traditional pastoralist's knowledge in livestock health (medication), areas suitable for rainwater harvesting and creation of Federal and Regional pastoral institutions.

Nori and Neely (2009) stated that building grazing land resilience as well as managing the livestock-cropland interface to the advantage of pastoralists and agriculturalists can provide an important opportunity for improving relationships, efficiency, equity, and the environment in dry lands.

Fidelis and Tyrell (2007) reported the opportunities and challenges as stated under:

Opportunities were raising demand for goat meat, low start-up cost, less labor intensive, brush control and multi-species grazing, prolific nature of goats. The challenges were the control of internal parasites and marketing goat meat. Despite the increasing demand, marketing goat meat was still a major challenge to the development of the meat goat industry. The prevailing market situation was reported erratic and not organized. There were no established standards for marketing goat meat, limited expertise and information, limited access to financial support.

Tsedeke (2007) reported that the opportunities in Sheep and goats production included modest interventions on the existing flock impediments, for example minimizing flock loss through diseases and parasites control and protection against predators and proper feeding during Belg and Meher cropping seasons could potentially boost the flock performances. It was further reported that sheep production and productivity in Ethiopia was constrained by factors like scarcity of feed, lack of infrastructure, high mortality rates, inadequate veterinary coverage, poor quality products and low average reproductive rates. It was also reported that high reproductive wastage is the major problem of sheep productivity.

Gibon and Mihina (2003) reported that conditions for beef cattle farming were favorable in the study area and were examined with SWOT in two regions viz., South-Hungarian region and West-Trans danubian region and Northern Plain region. The reported results are mentioned as under.

South Hungarian region and west –Trans danubian region

Strengths: favorable climatic conditions, vast marginal lands, traditionally well-developed livestock farming, good facility for professional education and training, well developed infrastructure

Weaknesses: slight decrease of livestock population, limited number of beef cattle farms, unfavorable economic conditions for launching beef cattle production, lack of

motivation and poor profitability conditions.

Opportunities: utilization of pastures and marginal lands by beef cattle, important capacity for developing beef production, support of young farmers, research facilities.

Threats: decline of the sector will continue, global recession on beef market.

Northern plain region

Strengths: High proportion of grasslands, vast marginal lands, traditionally well-developed livestock marketing, high motivation of population for livestock farming, empty buildings available for animal husbandry, food processing industry in the region is well developed.

Weaknesses: Limited number of beef cattle farms, lack of capital, low profitability conditions, lack of professional education and training.

Opportunities: Utilization of pastures and marginal lands by beef cattle, important capacity to develop beef production, support to farmers, development of new type of integration.

Threats: Decline in the beef cattle production, frequent changes of agricultural regulation, BSE scandal, ageing of population in the region.

Budisatria (2006) reported following Strengths, Weakness, Opportunities and Threats of small ruminants in Central Java, Indonesia.

Strength: Prolific breeds, Good quality of manure, Abundance of forage, Demand for Etawah.

Weaknesses: Susceptibility to diseases, Feed shortage, Traditional management, Lack of household labour, Susceptibility to diseases.

Opportunities: Easy to sell, Access to credit, Stable prices, Regular extension advice.

Threat: Stealing Competition with other areas in selling kids, Limited access to credit, Competition with other areas in selling kids.

CHAPTER –3

Research Methodology

3. RESEARCH METHODOLOGY

Research methodology is the foundation for carrying out any research programme. Methodology is the way or method or process in which various stages of analysis are employed systematically and scientifically to solve the research problem. In social sciences, the term 'Research Methodology' is concerned with the description of methods and procedures used during the research programme. It is considered as the 'blue-print' of the research-architect. This chapter is devoted to explain different methods, procedures, and techniques followed in the present investigation. The methodology adopted in conducting the research is discussed under the following sub-heads:

3.1 Research design

3.2 Locale of the study

3.3 Sampling procedure

3.4 Variables and their measurement

3.5 Data collection

3.6 Statistical analysis

3.1 RESEARCH DESIGN

Exploratory or Formulative research design was adopted in the present investigation. The main purpose of the exploratory studies is the identification of the problems, the more precise formulation of problem including the identification of variables. Here the researcher is involved in investigating an area or subject in which the individual is not sufficiently knowledgeable to have formulated detailed research questions. No clear hypothesis can be developed about the problem. In short, the researcher seeks to gain familiarity and/or to achieve new insights into the problem situation. The exploratory study is flexible in nature so non probability sampling method (purposive sampling) can be used. There is no fixed decision about the operational

procedure. For collection of data generally semi structured interview schedule can be used. Some important techniques useful for conducting exploratory research study are secondary data analysis (review of literature), pilot surveys and focused group interviews.

3.2 LOCALE OF THE STUDY

3.2.1 DESCRIPTION OF THE STUDY AREA

The present study was conducted in Jammu & Kashmir state which is shown in the Figure 3.1. It is a hilly State with total area of 2,22,236 sq. km that sprawls over the western Himalaya and Korakoram mountains between 32.17° N and 36.58° North latitude and 73.26° E and 83.30° East longitude. The state is surrounded by number of foreign countries i.e. Pakistan in the West, Afghanistan in the Northwest and China in the Northeast. The Jammu region falls in Pir Panchal range which is situated 2000 meters above the sea level. Kashmir region lies totally within the Himalayas surrounded by high hills of Peer Panchal range and Korakoram range (K2). It is interesting to note that the culture, climate and convention vary from region to region. The J&K State has got its importance in many respects. The State is endowed with rich agricultural and mineral resources. It has a very sound horticultural background and huge availability of high altitude alpine and sub alpine pastures. The state has four geographical zones of (i) Sub-mountain and semi-mountain plain known as Kandi or dry belt, (ii) the Shivalik ranges, (iii) the high mountain zone constituting the Kashmir valley, Pir Panchal range and its off-shoots including Doda, Poonch and Rajouri districts and part of Kathua and Udhampur districts and (iv) the middle run of the Indus river comprising Leh and Kargil.

3.2.2 SELECTION OF THE STUDY AREA

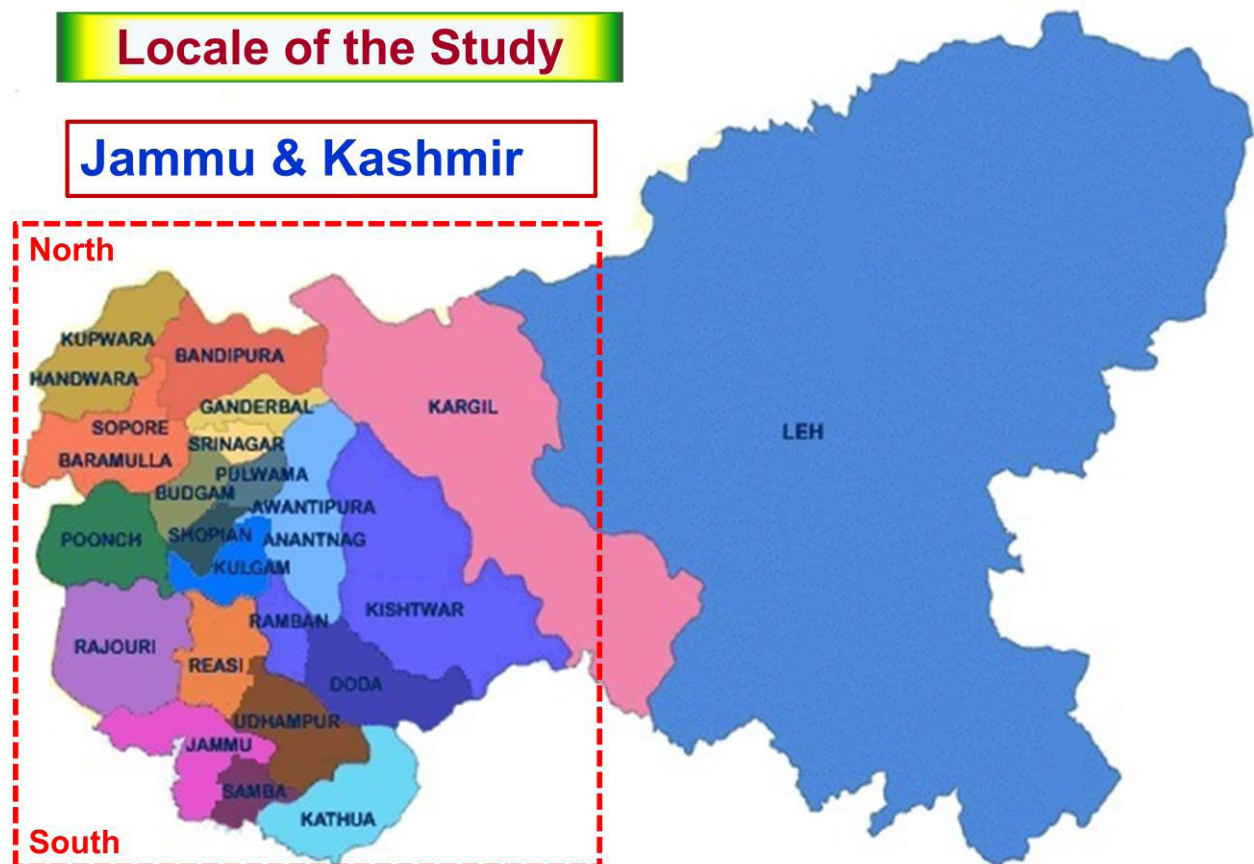
Selection of Jammu & Kashmir

The Jammu & Kashmir state was selected purposively for the study with the following reasons:

1. Major chunk of the small ruminant rearing of the state is done by pastoralist tribes (Gujjar, Bakerwal, Bot and Changapa). Bakerwals are the largest small



Figure 3.1: Map of India and Locale of the study



ruminant rearing pastoralists in Himalayan region of J & K. Further there are conducive agro-climatic conditions and rich alpine pastures and other endowments that provide enough scope for small ruminant rearing in J&K.

2. There is a deficit of mutton production in the state to meet its domestic demand and so state imports 2/3 of its mutton requirement from the neighbouring states. Annually it is importing 14 lakh sheep and goat from outside. Also majority (60%) of non-vegetarian population of the state has liking for mutton (sheep & goat meat) while scenario is reverse at national level (State sheep husbandry Dept Jammu). Both the above factors viz. high demand and liking for goat and sheep meat give a good reason to study small ruminant rearing among Bakerwals of Jammu & Kashmir.
3. Also very few studied are there relating to small ruminant rearing among pastoralists in J&K. Further knowing the local dialect of the area is an added advantage to establish a good rapport with the respondents that will help in good data collection.

3.3 SAMPLING PROCEDURE

The Bakerwal pastoralists of Jammu & Kashmir are found almost in all the four geographical zones of Jammu & Kashmir, in different phases of their migration for different purposes and for different durations of time. During winter season they are found in the pastures in low hills and plain regions of Jammu region. During the summer season they are found in the subalpine and alpine high altitude pastures in the valley of Kashmir and Kishtwar and Doda districts of Jammu. They even reach to some pastures in the Kargil and Leh districts in the Ladakh. There are many small and big migration routes from winter pastures to summer pastures and vice versa, spanning over many districts of the state. From among all these routes of migration, 6 major routes of migration were identified by consultation with Sheep Husbandry Departments of both divisions of Jammu & Kashmir state and by conducting self/pilot survey. These migration routes were covering almost all the major migration movements of the Bakerwals.

It usually takes Bakerwals 40 to 65 days for the migration between summer and winter locations. During the migration they take rest at certain camping sites based on the availability of feed and forages and water for their livestock. They stay at these locations for 4 to 5 days, make rest themselves and provide time for their animals to take rest. Along these routes there are certain nodal areas along which majority of the Bakerwals have to pass to reach their final destinations. These nodal areas are the small pastures lands where Bakerwals coming from different locations have to cross. It was at these nodal areas and some camping sites adopted by Bakerwals along the migration routes, that respondents were personally met and collecting of data was done. These locations were found ideal for the collection of data and observation of various activities of Bakerwals. Along each selected route of migration 20 respondents were selected randomly for interviewing. Thus a total of 120 respondents were included in the data collection. The sampling plan of the study is shown in Figure 3.2.

For SWOT analysis respondents were selected purposively for group discussions. Five group discussions were done in total, two between members of Sheep Husbandry Departments J&K and three between members of Bakerwal community. These discussions were facilitated by the researcher himself. Five experts each from Sheep husbandry Departments of Jammu and Kashmir divisions were selected. Among the Bakerwals the respondents with well knowhow of their community were selected in group discussion purposively. Each of the selected groups had five members each. So in total 5 groups with 25 respondents were selected purposively for SWOT analysis. These group discussions helped in getting various SWOT factors or elements which were later used in Analytical Hierarchy Process to get the various challenges and opportunities in small ruminant rearing among Bakerwal pastoralists in Jammu & Kashmir.

3.4 VARIABLES AND THEIR EMPIRICAL MEASUREMENT

For the present study, relevant variables have been selected after extensive review of relevant literature and consultation with the experts considering the theoretical background and the objectives of the study. The first set of variables was related to

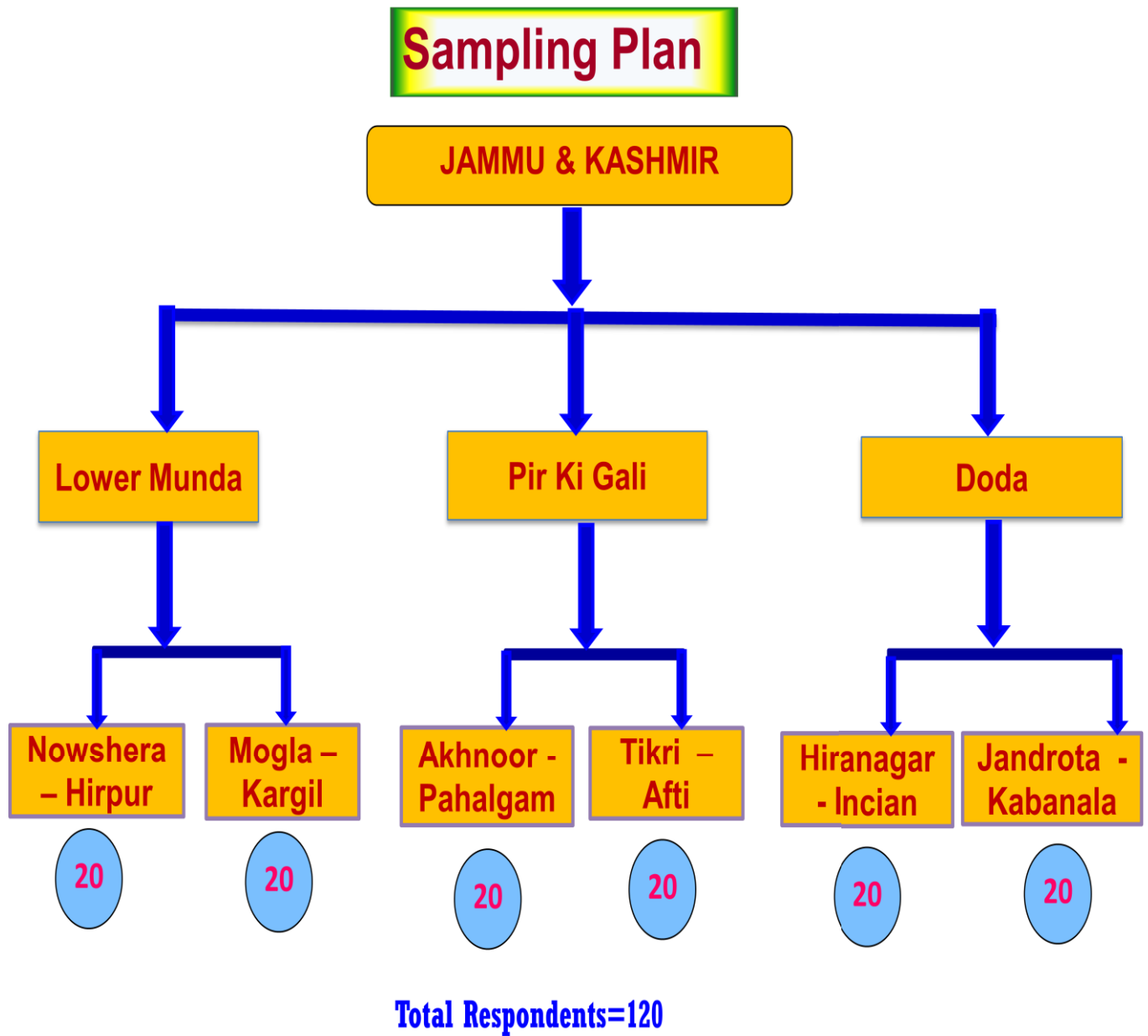


Figure 3.2: Sampling plan of the study

the profile characteristics and migration aspects of the Bakerwals. This was followed by the variables related to the management practices followed by Bakerwals in small ruminant rearing and finally by livelihood security variables. The selected variables and their measurement procedures have been mentioned in Table 3.1.

Table-3.1: Selected variables and their empirical measurements

SI No	Variables	Measurement
1	Age	Direct questioning
2	Education	Schedule developed by Somasundaram (1995)
3	Family Size	Schedule was developed
4	Social Participation	
5	Sources of information	
6	Landholding	Schedule developed by Pushpa, 1996
7	Occupation	Schedule was developed
8	Herd size	
9	Annual income	
10	Culture practices (Clan, Festivals, Beliefs)	Open ended questions
11	Herd, composition, ownership and structure	Schedule was developed
12	Migration aspects	
13	Marketing pattern	
14	Management practices (feeding, breeding, healthcare and general management)	
15	Livelihood security (Natural, Human, Social, Physical and Financial assets)	Index was developed

3.4.1 OPERATIONALIZATION AND MEASUREMENT OF VARIABLES

Socio- Personal Variables

3.4.1.1 Age: it refers to the chronological age of the respondents (in years) round to the nearest whole number at the time of interview. It was ascertained by direct questioning. Further respondents were classified on the following three categories as per census report of government of India.

Young	:	Up to 35 years
Middle aged	:	36 to 50 years
Old aged	:	above 50 years

3.4.1.2 Education: It was operationalised as the level of formal education attained by an individual respondent. It was measured by direct questioning. The scoring procedure followed by Somasundaram (1995) was followed with slight modification. The respondents were assigned score as:

Illiterate	:	0
Functionally literate	:	1
Primary	:	2
Middle	:	3
Secondary(High school)	:	4
Higher Secondary/ Intermediate	:	5
Graduate and above	:	6

3.4.1.3 Family Size: It refers to the number of individuals living under the same roof and sharing kitchen together in a household. In the present study family size refers to the number of individuals sharing the same kitchen, but may be living in same or different tents and/or same house in case of Bakerwals. The respondents were

classified into small, medium and large family size category groups on the basis of cumulative square root frequency method.

Small	: Less than 8
Medium	: 8 to 10
Large	: More than 10

3.4.1.4 Social participation: it was conceptualized as respondents' participation in social institution as a member or as an office-bearer. Subramanian's scale (1982) with some modifications was used to measure it. The score assigned for member were; for no membership, 0, member in one organization, 1; membership in more than one organization, 2 and officebearer 3 was allotted as below. The respondents were categorized into three categories as follows:

Category	: Code
No membership	: 0
Membership in one organization	: 1
Membership in more than one organization	: 2
As an office – bearer	: 3

3.4.1.5 Sources of information: It refers to the degree of individual contact with different sources in order to acquire information, which adds to the knowledge of the respondents regarding small ruminant rearing. For quantifying the source of information used by respondents 4 institutional (Village panchayat personal, Extension personal, veterinary surgeon and NGO's), 4 non institutional (village key personal, other livestock owners in village, traditional healers/ vaidya(s) and relatives) and 6 mass media (radio, television, newspaper, veterinary awareness camps, farm publication and poster) information sources related to animal husbandry were listed.

3.4.1.6 Type of pastoral system: it refers to the different ways of pastoralism carried out by the Bakerwal pastoralists like nomadic, transhumant and sedentary. The term nomadic is used when mobility is high and in irregular pattern; transhumant when there is regular back and forth movements between relatively fixed positions; and sedentary for the rest.

Socio- Cultural Variables

3.4.1.7 Culture practices or attributes: It refers to custom, folks, beliefs, festivals, taboos, rituals followed by the particular tribe. In the present study it was operationalized as the clans, festivals and beliefs in relation to small ruminant rearing.

Socio- Economic Variables

3.4.1.8 Land holding: It was operationally defined as the total number of acres of land owned and leased in by an individual family at the time of investigation. It was determined by a schedule developed for the same. The respondents were classified into landless, marginal, small, medium and large categories as follows.

Category	: Area (acres)
Land less	: 0.00
Marginal	: Up to 2.50
Small	: 2.51-5.00
Medium	: 5.01 – 10.00
Large	: More than 10.00

3.4.1.9 Occupation: It was operationally defined in terms of respondent's source of earning viz., goat and sheep rearing, agriculture and labor. Respondents were asked to indicate their main and subsidiary occupation separately. Respondents were later on classified into following occupation categories.

- Small ruminant rearing only
- Small ruminant rearing + agriculture

- Small ruminant rearing + labor
- Small ruminant rearing + agriculture + labor

3.4.1.10 Annual Income: Operationally defined as the income generated from various sources in one year by the respondent at the time of investigation. The various sources of income in case of Bakerwals includes sale of live animals, wool and hiring charges of the animals taken for pasturing from other Bakerwals or local people or labour. The respondents were classified into low, medium and high income category groups on the basis of cumulative square root frequency method.

3.4.1.11 Composite flock size: it refers to the number of Goat and Sheep herded during migration by the Bakerwal pastoralist respondents at the time of investigation. These animals may be its own or shared with other pastoralists or taken from others for earning income.

3.4.1.12 Livestock ownership pattern: It refers to the proportion of small ruminant animals owned, shared and taken for pasturing by the respondent at the time of interview.

3.4.1.13 Herd composition and Size: It refers to the species of animal possessed by the respondents and total number of different animals owned by the respondent at the time of investigation.

3.4.1.14 Marketing pattern: It refers to the mode of selling of animals and animal products and the marketing channels adopted by the pastoralists for the sale of their produce. Their produce mainly included live animals and wool. The marketing channels were identified by direct questioning of the respondents where they were asked to whom they sell their produce and how as per their knowledge it reaches to the end users or consumers.

3.4.1.15 Migration aspects: It refers to the combination of acts, modes of behavior and distinctive life style of the migrating families adopted during migration. For the present study, the migration pattern was restricted with the various parameters like route, distance and time of migration, number of families migrating as a single group

or Qafila, livestock mobility, sources of treatment along the route of migration, reasons for migration and problems of migrations.

3.4.1.16 Management practices: It is operationalized as the existing feeding, breeding, health care and general management practice followed by the respondent for rearing of Goat and Sheep.

3.4.1.17 Ethno veterinary practices: represent the traditional techno cultural tool for Goat and Sheep health care among Bakerwal pastoralists. In the present study ethno veterinary practices were operationalized as the study of knowledge and practices of Bakerwals with regard to treatment of different diseases of livestock like wound, fracture, sheep pox, bloat, diarrhoea, etc., by using locally available resource.

3.4.2 DEVELOPMENT OF PASTORALIST LIVELIHOOD SECURITY INDEX

Livelihoods consist of the capabilities, assets - both material and social resources - and activities required for a means of living. Livelihood security is the ability of the people to get adequate access and availability of income and other resources to meet basic needs including food and nutrition, health facilities, habitat facilities, educational opportunities and community participation and social integration. In the present context the livelihood security was operationalized as the possession of the Bakerwal pastoralists with adequate availability and access to various assets or dimensions of livelihood security which directly or indirectly helps them to meet basic needs including nutrition, clothing, healthcare, education, community participation, social integration etc. Different workers have used different dimensions for assessing the livelihood security of tribal communities or other class of vulnerable people. But based on the extensive review of literature and expert consultation, the relevant dimensions which included natural, social, human, physical and financial assets were selected for the study. The selection of these dimensions was based on the rationale that when the pastoral people would have availability and access to these assets then their livelihood would be secured. The various steps involved in the construction of Pastoralist Livelihood Security Index (PLSI) are elaborated as under.

A) Selection of Dimensions of Livelihood Security

Assessment of livelihood security is a multidimensional analysis. For assessing the livelihood security various contributing dimensions have to be taken care off. The selected dimensions for the present study included Natural assets, Social assets, Human assets, Physical assets and Financial assets, the acquirement of which were essential for the livelihood security of the Bakerwal pastoralists. The operationalization of the identified dimensions of PLSI is given below:

SI No.	Dimensions	Operational definition
1	Natural Assets	Assets comprising land, forest and grasslands, grazing reserves, natural water-points and rivers and the livestock, which were forming their capital base and were available naturally
2	Social Assets	Assets comprising social resources such as networks, membership of groups, relationships of trust and access to wider institutions of society upon which people draw in pursuit of livelihoods
3	Human Assets	Assets which included the skills, knowledge, ability to labour and good health which were important to the ability to pursue different livelihood strategies
4	Physical Assets	Assets which included transport, shelter, water, energy, communications and production equipments and facilities, which were considered essential for utilising other assets effectively for their livelihood security
5	Financial Assets	Assets including the primary source of pastoral income, saving, loan, gift, investments and insurance

B) Determination of Relative Weightage of Various Dimensions

It is important to mention here the above selected dimensions were very important for the livelihood of the Bakerwal pastoralists, but among themselves these dimensions were having different relative importance in ensuring livelihood security. Thus to assign appropriate weightage to each dimension, 50 judges who were experts in field of Extension Education, Social Science, Rural Development, Animal husbandry and Sheep husbandry, were requested to assign appropriate weightages, out of 100 to each of these five indicators. The proforma (index) containing various dimensions of PLSI was sent either by post or e-mail or was handed over personally to the judges. Out of total only 40 judges had returned the same set of indicators after dully recording their judgment in a stipulated span of two months. Out of 40 responses 5 were found vague, unsuitable for analysis and so discarded. The remaining 35 responses were considered for further analysis. The means of total scores of each dimension were calculated and were taken as their respective relative weights which are given below:

SI No	Different dimensions of Livelihood security	Weightage
1	W1- Weightage for Natural Assets	0.8423
2	W2- Weightage for Social Assets	0.7090
3	W3- Weightage for Human Assets	0.7154
4	W4- Weightage for Physical Assets	0.6577
5	W5- Weightage for Financial Assets	0.7559

C) Selection of Indicators

Indicators under each dimension of PLSI were selected through expert consultation and literature scan. Special care was taken to include as many as indicators so as to cover maximum scope of each dimension. The following steps were followed for selecting relevant indicators under each dimension of PLSI.

- a. **Collection and Editing of Indicators:** By referring the available literature on relevant subject, a total 60 statements were collected covering the almost entire universe of content. The researchers and extension experts were also consulted for selecting statements. These indicators were edited as per 14 informal criteria suggested by Edwards (1957) as outcome 10 indicators were eliminated. Finally, 50 indicators were retained after editing and considered for judge's rating.
- b. **Response to Indicators:** The Performa (index) containing 50 indicators on three point continuums i.e. Most Relevant, Relevant and Least Relevant was sent by post, through e-mail or handed over personally to the total of 50 judges. These judges were experts in the field of Extension Education, Social Science, Animal husbandry and Sheep husbandry. The judges were requested to indicate their response by tick mark in suitable continuum in front of each indicator. Also the judges were requested to make necessary modifications and additions or deletions, if they desired so. Out of 50 judges, 40 judges had returned the same set of indicators after duly recording their judgments in a stipulated span of two month. Out of forty responses 5 were found unsuitable for item analysis and eliminated after careful examination of responses. The remaining 35 were considered for the item analysis.
- c. **Relevancy Test or Item analysis:** Item analysis is an important step while constructing valid and reliable index. It is possible that all the indicators collected may not be relevant equally in measuring the status of livelihood security of pastoralists. Hence, these indicators were subjected to scrutiny and their subsequent screening for inclusion in the final index. The judges were asked to indicate degree of relevancy on each indicator with three point continuums 'Most Relevant, Relevant and Least Relevant' with scoring 3, 2, and 1, respectively. The Relevancy Weightages (RW) and mean Relevancy Score (MRS) were worked out for all the selected indicators individually by using the following formula;

$$RW = \frac{\text{More relevant response SA} * 3 + \text{Relevant response A} * 2 + \text{Least relevant response DA} * 1}{\text{Maximum possible score}}$$

$$MRS = \frac{\text{More relevant response SA} * 3 + \text{Relevant response A} * 2 + \text{Least relevant response D} * 1}{\text{Number of Judges}}$$

By using these two criteria the indicators having Relevancy Weightage (RW) > 0.70 and Mean Relevancy score (MRS) > 2.25 were considered for inclusion in the PLSI. By this procedure, final indicators of respective dimensions of PLSI were selected, modified and rewritten as per the comments of judges. The various set of indicators/ statements/ items was prepared under each dimension for final data collection from the respondents. The finally selected dimensions of PLSI and their respective indicators with respective relevancy weightage and mean relevancy score are shown in Annexure-

D) Computation of Composite index

Each dimension of index for PLSI consisted of different number of indicators and hence, their range of total scores was different. Therefore, the score of each indicator was converted into unit score by using simple range and variance as given below,

$$Zind_j = \frac{Indicator_j - Min_j}{Max_j - Min_j}$$

Where,

$Zind_j$ = Standardized indicator score of the j^{th} indicator on a given dimension of livelihood security.

Max_j = Maximum score of j^{th} indicator on a given dimension.

Min_j = Minimum score of j^{th} indicator on a given dimension.

Thus, the $Zind_j$ score of each indicator range from 0 to 1 i.e. when $Zind_j$ is minimum, the score is 0 and when $Zind_j$ is maximum the score is 1. Once each indicator representing a particular livelihood security domain is standardized, then the relevant household livelihood security index for the particular livelihood security domain is constructed by averaging the standardized indicators:

$$HLSI_i = \sum Zind_j / J \text{ (where J runs from 1 to J)}$$

Where J is the number of indicators used to construct the given dimension 'i' of the index.

Once each HLS index is constructed, then the composite overall livelihood security Index (LSI) for the household is constructed by using the formula in equation ()

$$PLSI_i = \frac{\sum HLS_{li} * W_i}{Sum\ of\ weighted\ mean}$$

Where,

$PLSI_i$ = Index for Livelihood Security of i^{th} respondent

$Zind_j$ = Standardized indicator score of the j^{th} indicator on i^{th} dimension for a given respondent.

W_i = weighted mean of the j^{th} component/asset/dimension

Σ = Sum

The status of respondent's livelihood security was calculated based on total index scores of all the indicators. The classification of respondents into the categories of low, medium and high livelihood security was finally done by cumulative square root frequency method.

E) Standardization of Index

The validity was ascertained for standardization of the index. It is the property that ensures the obtained test scores as valid, if and only if it measures what it is supposed to measure. An index is said to be valid if it stands for one's reasoning. The validity was ascertained by content validity method. The content of the index was thoroughly covered through literature scan and expert opinion. The indicators which had at least 80 per cent judges' agreement were retained. This indicated validity of the content of index. As the weighted scores of dimensions, relevancy weightages and mean relevancy scores of all the dimensions and indicators had discriminating values, it seemed reasonable to accept the index as valid measure of the desired dimensions.

3.4.3 OPPORTUNITIES AND CHALLENGES

The opportunities and challenges of small ruminant rearing among Bakerwal pastoralists of J & K state were identified and quantified by utilizing a combination of SWOT analysis and Analytical Hierarchy Process.

3.4.3.1 SWOT Analysis and Analytical Hierarchy Process

The Analytic Hierarchy Process (AHP) is a mathematical method for analyzing complex decision problems with multiple criteria. It was originally developed by Saaty (1977, 1980). Basically, AHP is a general theory of measurement based on some mathematical and psychological foundations. AHP can deal with qualitative attributes as well as quantitative ones. It has been found to be a useful decision-analysis technique and it has been applied in cases dealing with strategic planning, including marketing applications (Wind and Saaty, 1980), design and evaluation of business and corporate strategy (Wind, 1987).

The decision situation at hand is an evaluation process in which SWOT and AHP can both be used. SWOT provides the basic frame within which to perform an analysis of the decision situation and AHP assists in carrying out SWOT more analytically. The possible advantages of using AHP in SWOT analysis lie in the quantitative examination of the SWOT factors and inclusion of preferences of the decision makers in the planning situation. In addition, AHP and SWOT are both widely used, basic methods, and they are relatively easy to understand. Thus, they both are well suited to be used also in studying challenges and opportunities in small ruminant rearing. The objective of this study is to look into SWOT factors in greater detail and more systematically.

3.4.3.2 Outline for applying AHP in SWOT analysis

When applying AHP, a hierarchical decision schema is constructed by decomposing the decision problem into its decisions elements. The importance or preferences of the decision elements are compared in a pair wise manner with regard to the element preceding them in the hierarchy. Numerical techniques are used to derive quantitative values from verbal comparisons (Kangas, 1992). Subjective

preferences, expert knowledge and objective information can all be included in the one and the same decision analysis. Basically, the results of an AHP analysis are the overall global priorities of decision alternatives. The idea in utilizing AHP within a SWOT framework is to systematically evaluate SWOT factors and commensurate their intensities. AHPs advantages, i.e. systematic approach to decision problems and commensurateness, can be regarded to be valuable characteristics in SWOT analysis. Additional value from a SWOT analysis can be achieved by performing pair wise comparisons between SWOT factors and analyzing them by means of the eigenvalue technique as applied in AHP. This offers a good basis for examining the present or anticipated situation, or a new strategy alternative, more comprehensively. After carrying out these comparisons, decision makers will have new quantitative information about the decision making situation; for example, whether there is a specific weakness requiring all the attention, or if the company/organization/enterprise/livelihood source is expected to be faced with future threats exceeding the company's combined opportunities.

In our study we used the method used by Kurrtila *et al.*, (2000) which was little modified to suit our study which was to study challenges and opportunities in small ruminant rearing among Bakerwal pastoralists. The following definitions need to be made at this point; SWOT groups refer to four entities i.e. strengths, weaknesses, opportunities and threats and SWOT factors refer to the individual factors underlying these groups. The method introduced proceeds as follows:

Step1. SWOT analysis is carried out

The relevant factors of the external and internal environment are identified and included in SWOT analysis. When standard AHP is applied, it is recommended that the number of factors within a SWOT group should not exceed 10 because the number of pairwise comparisons needed in the analysis increases rapidly (Saaty, 1980). Here in our case SWOT factors were identified by focused group discussions with the experts of Sheep Husbandry Department of Jammu and Sheep Husbandry Department of Kashmir with each group having five members. Three more focused group discussions were done with Bakerwals with each group consisting of 5

members. These discussions were initiated by the researcher with the help of information obtained from the extensive review of literature. As an outcome of these discussions we came out with twenty SWOT factors five in each group. These factors were then made into a schedule which was later used in SWOT analysis and AHP.

Step-2. Pairwise comparisons between SWOT factors are carried out within every SWOT group

When making the comparisons, the questions at stake were: 1. which of the two factors compared was a greater strength, opportunity, weakness or threat; and 2. how much greater. With these comparisons as the input, the relative local priorities of the factors were computed using the eigen-value method described below. These priorities reflect the decision maker's perception of the relative importance of the factors. Here the modification was applied. In the actual method there was a single decision maker or judge who was assisted by the researcher to use AHP and getting the results. But in our case we had 25 respondents. So an aggregation method was used to aggregate the subjective responses of many respondents and come up with the single aggregate representative results. The Aggregating Individual Judgment method (IJM) was used. In these method priorities of SWOT factors were and SWOT groups were calculated by using geometric mean.

Step-3. Pairwise comparisons are made between the four SWOT groups

The factor with the highest local priority was chosen from each group to represent the group. These four factors were then compared and their relative priorities were calculated as in Step 2. These are the scaling factors of the four SWOT groups and they are used to calculate the overall global priorities of the independent factors within them. This is done by multiplying the factors' local priorities defined in Step 2. by the value of the corresponding scaling factor of the SWOT group. The global priorities of all the factors sum up to one.

Step-4. The results are utilized in the strategy formulation and evaluation process

The contribution to the strategic planning process comes in the form of numerical values for the factors. New goals may be set, strategies defined and such implementations planned as take into close consideration the foremost factors. The matrix of pair wise comparisons (Eq. (1)) is constructed in Step 2. In this matrix, the element $a_{ij} = 1/a_{ji}$ and thus, when $i = j$, $a_{ij} = 1$. The value of w_i may vary from 1 to 9, and $1/1$ indicates equal importance while $9/1$ indicates extreme or absolute importance.

$$\mathbf{A} = \begin{bmatrix} 1 & w_1 / w_2 & \dots & w_1 / w_n \\ w_2 / w_1 & 1 & \dots & w_2 / w_n \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ w_n / w_1 & w_n / w_2 & \dots & 1 \end{bmatrix} \quad (1)$$

In the comparisons, some inconsistencies can be expected and accepted. When $\mathbf{A}$ contains inconsistencies, the estimated priorities can be obtained by using the matrix [Eq. (1)] as the input using the eigen-value technique [Eq.(2.)].

$$(\mathbf{A} - \lambda_{\max} \mathbf{I})\mathbf{q} = 0 \quad (2)$$

Where $\lambda_{\max}$ is the largest eigen-factor of matrix $\mathbf{A}$; $\mathbf{q}$ is its correct eigen-factor; and $\mathbf{I}$ is the identity matrix. The correct eigen-factor, $\mathbf{q}$, constitutes the estimation of relative priorities. It is the first principal component of the matrix of pairwise comparisons. If the matrix does not include any inconsistencies, i.e. the judgments made by a decision maker have been consistent; $\mathbf{q}$ is the exact estimate of the priority vector. Each eigen-factor is scaled to sum up to one to obtain the priorities. Saaty (1977) has shown that $\lambda_{\max}$ of a reciprocal matrix $\mathbf{A}$ is always greater or equal to n (= number of row = number of columns). If the pair wise comparisons do not include any inconsistencies, $\lambda_{\max} = n$. The more consistent the comparisons are, the closer the value of computed $\lambda_{\max}$ is to n .

Based on this property, a consistency index, CI, has been constructed (Eq. (3)).

$$CI = (\lambda_{\max} - n) / (n - 1) \quad (3)$$

CI estimates the level of consistency with respect to a comparison matrix. Then, because CI is dependent on n , a consistency ratio CR is calculated, which is independent of n (Eq. (4)). It measures the coherence of the pairwise comparisons. To estimate CR, the average consistency index of randomly generated comparisons, ACI, has to be calculated. ACI varies functionally, according to the size of the matrix (e.g. Saaty, 1980).

$$CR = 100 (CI/ACI) \quad (4)$$

As a rule of thumb, a CR value of 10 percent or less is considered to be acceptable. Otherwise, all or some of the comparisons must be repeated in order to resolve the inconsistencies of the pair wise comparisons. Thus, the results of the comparisons are quantitative values expressing the priorities of the factors included in SWOT analysis. Thereby, persons formulating strategies gain access to new quantitative information about the environment surrounding their firm /organization/business to support their decision making. They can concentrate on connecting the most important and compatible opportunities and strengths in the strategy-building process or see if the firm is facing some critical threats or weaknesses that must be reacted to.

Table of Random Indices

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

(Adopted from Satty and Forman, 1992: actual calculations made by Satty, 1977)

3.5 DATA COLLECTION

A personal interview schedule was developed keeping in view the objectives and variables of the study. Background information of the study area was obtained through personal observation and key informant discussions with the respondents,

experts and subject matter specialists. Before the actual data collection, several visits were made to build rapport with the respondents and to gain familiarity with the conditions and the system of respondents appropriate PRA tools like key informant interviews, group interviews, focused group discussions, transect walk etc. were used during the course of study.

3.6 STATISTICAL TOOLS

The collected data were tabulated keeping in view the objectives of the study and the ease of statistical analysis. The data were then analyzed using descriptive statistics (simple frequency, arithmetic mean, geometric mean, standard deviation etc.) cumulative square root frequency method and matrix analysis methods.

CHAPTER –4

Results and Discussion

4. RESULTS AND DISCUSSION

In light of the objectives set forth for the study, the data collected from the respondents were analyzed using appropriate analytical methods as described in the previous chapter of research methodology. The results obtained from analysis have been presented under the following heads:

4.1 Profile of the respondents

4.2 Composition, Ownership and Structure of household livestock

4.3 Marketing pattern and marketing channels for small ruminant and their products

4.4 Migration aspects of Bakerwal pastoralists

4.5 Management practices of small ruminant rearing among Bakerwal pastoralists

4.6 Livelihood security of Bakerwal pastoralists

4.7 Challenges and Opportunities of small ruminant rearing among Bakerwal

4.1 PROFILE OF THE RESPONDENTS

Socio- personal profile of Bakerwal pastoralists

4.1.1 AGE

The results presented in the Table 4.1 show that the majority (54.17%) of the respondents belonged to the middle age (36-50 years) group. This was followed by the respondents of young (Up to 35 years) and old (>50years) age groups consisting of 30.00 per cent and 15.83 per cent of respondents, respectively.

4.1.2 EDUCATION

A cursory look on Table 4.1 show that the great majority i.e., 87.50 per cent of the respondents were illiterate, followed by 8.33 per cent of primary, 2.50 per cent of middle and 1.67 per cent of respondents who had secondary level of education. The results show that the respondents had a very low education status. The main reason behind this was found to be the transhumant or nomadic mode of life of Bakerwals.

The other reason reported by the respondents was that the number of the functional mobile schools was as a result the respondents were unable to provide proper education to their children.

Table - 4.1: Socio - personal profile of the of the Bakerwal pastoralists
n = 120

Sl. no	Variables	Categories	Frequency	Percentage
1	Age Mean: 40.57 Range: 21 – 75	Young (Up to 35 years)	36	30.00
		Middle (36-50 years)	65	54.17
		Old (>50years)	19	15.83
2	Education	Illiterate	105	87.50
		Functionally literate	0	0
		Primary	10	8.33
		Middle	3	2.50
		Secondary	2	1.67
		Senior Secondary	0	0.00
		Graduate and Above	0	0.00
3	Family size Mean: 7.60 Range: 4 - 13	Small (< 8)	69	57.50
		Medium (8- 10)	32	26.67
		Large (>10)	19	15.83
4	Social participation	Membership in one organization	72	60.00
		Membership in more than one organizations	42	35.00
		As an office – bearer	6	5.00

4.1.3 FAMILY SIZE

The results presented in the Table 4.1 show that the family size of majority of respondents (57.50%) was small (<8), followed by 26.67 per cent respondents having medium (8-10) and 15.83 per cent of respondents having large (>10) family size. On an average the average family size was 7.60 within a range of 4-13 members per household.

4.1.4 SOCIAL PARTICIPATION

The results presented in the Table 4.1 show that majority (60.00 %) of the respondents had participation in only one organization followed by 35.00 per cent of the respondents with participation in two organizations. There were 5.00 per cent of the respondents who were office bearers in the social organizations. Again the migratory mode of their life, living in practically marginal and far flung areas and having separated and scattered distribution in pastures and during migration leads to their low social participation.

4.1.5 SOURCES OF INFORMATION

In the study it was revealed that the respondents did not get information from any of the institutional sources. Among the non-institutional sources all the respondents got information from relatives and other Bakerwals. They were not having access and availability of any of the mass media sources other than radio which was their only mass media source of information. Thus the study shows that more sources of information should be made accessible and available to the respondents to increase their level of information related to management and marketing of Goat and Sheep.

Socio Economic Profile of Bakerwal Pastoralists

4.1.6 LAND HOLDING

The results presented in the Table 4.2 clearly show that majority i.e., 70.00 per cent of the respondents belonged to landless category. Further 10.00 per cent of the respondents belonged to marginal, 11.67 per cent belonged to small and 5.00 per cent belonged to medium land holding category. Only a small fraction i.e., 3.33 per cent of the respondents belonged to large land holding category. Majority of the respondents were found, not having the land ownership and thus no land for permanent settlement but all the respondents were having traditional grazing rights in summer and winter pastures.

4.1.7 OCCUPATION

It was observed that all the respondents reared small ruminants as the primary occupation. From the results presented in the Table 4.2 it was evident that there

were 69.17 per cent of the respondents who had no secondary occupation. They did not sell milk of goat and sheep or any agricultural produce, which were utilized for home consumption only. Further there were 9.16 per cent of the respondents who practiced agriculture and dairy as secondary occupation. This was followed by 15.00 of respondents practicing labor and 6.67 per cent of respondents practicing both agriculture-dairy and labor as their secondary occupation.

4.1.8 FLOCK/ HERD SIZE

The respondents interviewed during migration were found herding flocks which had shared ownerships. A cursory look on the Table 4.2 reveals that the nearly half of the respondents i.e., 47.50 per cent had a small composite flock size of less than 185 Goat and Sheep. This was followed by 43.33 per cent of respondents having a medium composite flock size in the range of 185 to 286 Goat and Sheep. There were a small proportion i.e., 9.17 per cent of the respondents whose composite flock size was more than 286 Goat and Sheep. During the study it was found that the majority of the respondents had more number of Sheep in their flocks than the Goat; giving the reasons that sheep had more demand, was more profitable and was easy to rear compared to the goats.

Table - 4.2: Socio economic profile of the of the Bakerwal Pastoralists

n = 120

6	Land holding (Acres) Mean: 1.43 Range: 0 to 15	Landless (0)	84	70.00
		Marginal (Up to 2.5)	12	10.00
		Small (2.6-5)	14	11.67
		Medium (5.1-10)	6	5.00
		Large (>10)	4	3.33
7	Occupation	Only small ruminant rearing (SRR)	83	69.17

		SRR + Agriculture	11	9.16
		SRR + Labor	18	15.00
		SRR + Agriculture + Labor	8	6.67
8	Flock/herd size (nos.) Mean: 302 Range: 45-750	Small (< 185.10)	57	47.50
		Medium (185.10 - 286.84)	52	43.33
		Large (> 286.84)	11	9.17
9	Annual income (Rupees) Mean: 116345 Range: 40700-216800	Low (< 87249.21)	81	67.50
		Medium (87249.21 to 136846.3)	28	23.33
		High (> 136846.3)	11	9.17

4.1.9 ANNUAL INCOME

The results presented in the Table 4.2 elucidate that majority i.e., 67.50 per cent of the respondents belonged to low income group having income of less than Rs. 87249.21. This was followed by 23.33 per cent of the respondents in the medium income category with income ranging from Rs. 87249.21 to Rs 136846.3 and 9.17 per cent of respondents in higher income group with average annual income of more than Rs. 136846.3.

During the course of investigation it was observed that the main income sources of Bakerwal pastoralists were sale of live animals and wool, labor or hiring charges for pasturing the animals of others.

Table –4.3: Share of Income of respondents from different sources**n = 120**

SI No	Sources	Income	Percentage
1	Live animal sale	7116500	75.57
2	Labor	644000	6.84
3	Wool	1056430	11.22
4	Hiring charges for animals	600000	6.37

From the results presented in the Table 4.3, it is clearly evident that the major share i.e., 75.57 per cent of the annual income comes from the sale of live animals. Sale of the wool contributed 11.22 per cent while labor constituted only 6.84 per cent to the total household (Deras) income of the Bakerwals. Further 6.37 per cent of the total income was contributed by the hiring charges got for pasturing the Goat and Sheep of other Bakerwals or local village people.

Socio-cultural profile of the Bakerwal pastoralists

4.1.10 CLAN

The results of the study as presented in the Table 4.4 clearly show distribution of the respondents in various clans of the Bakerwal tribe. The respondents of the study belonged to the nine clans namely Bokad, Khatana, Pujwala, Lali, Kasana, Chaechi, Lehiwal, Badana and Janjua. Majority of the respondents belonged to Lehiwal (15.00%), Khatana (15.00%) and Badana (13.33%) clans. Inter-marriages were taking place between different clans.

4.1.11 FESTIVALS

During the study it was found that all Bakerwals were Muslims. They celebrate festivals like Nauroz, Satimi, Shabi Qadr, Eid-ul-Fitr, Eid-ul-Azha, Eid Meelad-un-Nabi, Moharam etc. Further it came to be known from the respondents that they celebrated their arrival in the summer pastures with feasts; where the members of

the Dera celebrate the accomplishment of making it to pastures together. Usually a few goats and sheep were slaughtered on this occasion.

Table - 4.4: Different clans of Bakerwal Pastoralists

n = 120

Sl. no	Clans	Number	Percentage
1	Bokad	11	9.17
2	Khatana	18	15.00
3	Pujwala	13	10.83
4	Lali	10	8.33
5	Kasana	11	9.17
6	Chaechi	14	11.67
7	Lehiwal	18	15.00
8	Badana	16	13.33
9	Janjua	9	7.5

4.1.12 BELIEFS

The study also explored the beliefs of the respondents related to small ruminant rearing. The Bakerwal pastoralists were very superstitious. Their belief systems had mainly religious orientation. They believed in 'Nazar' which means Evil eye. They believed that some persons have evil eye and their viewing their flock leads to diseases and deaths in their animals. They also had strong belief in 'Peers' and their 'Special prayers' and 'Taveez'. They visited Peers (religiously noble men) and requested them for praying for the safety, health and prosperity of their flocks. They also got special papers written by these Peers called "Taveez", which had some Verses of Quran and numbers written on it. They tied Taveez around the neck of the

animals, or burnt it, in front of animals for making them inhale its smoke, or adding it to water and then drenching that water to the sick animals. They also believed in raising 'Chadar' over the graves of local saints for getting their blessings.

**Table - 4.5: Beliefs of Bakerwal pastoralists related to Goat and Sheep rearing
n = 120**

Sl. No	Beliefs	Frequency	Percentage
1	Nazar (Evil eye)	90	75.00
2	Visiting "Peer" or "Hakeem" to performs special prayer	110	91.67
3	Khatam	85	70.83
4	Making sick animals to pass under a particular Sacred cloth that was under the custody of the "Peer"	25	20.83
5	Tavez (Chit of paper on which verses of Quran or some numbers are written by Peer)	105	87.50
6	Offering of "Chadars" at the Shrines of saints	51	42.50

One other belief was Khatam, in which Bakerwals invite other members of the community particularly close relatives and a Peer and some of his close followers and then together pray for the health and wellbeing of themselves and their flocks. The close perusal of the results presented in Table 4.5 clearly shows that a huge majority of the respondents had a faith in most of these beliefs.

4.2 COMPOSITION, OWNERSHIP AND STRUCTURE OF LIVESTOCK

4.2.1 COMPOSITION OF LIVESTOCK

It was found that the livestock holding of Bakerwal pastoralists was dominated by Sheep and Goat. Some of them also kept cattle for milch purpose. They also had horses (as pack animals) for carrying baggage and luggage during migration. They kept Bakerwal shepherd watch dogs for protection of the flock. The goats were mainly of Bakerwal and Khagani breeds. The sheep were either of Rambli

Clans of Bakerwals

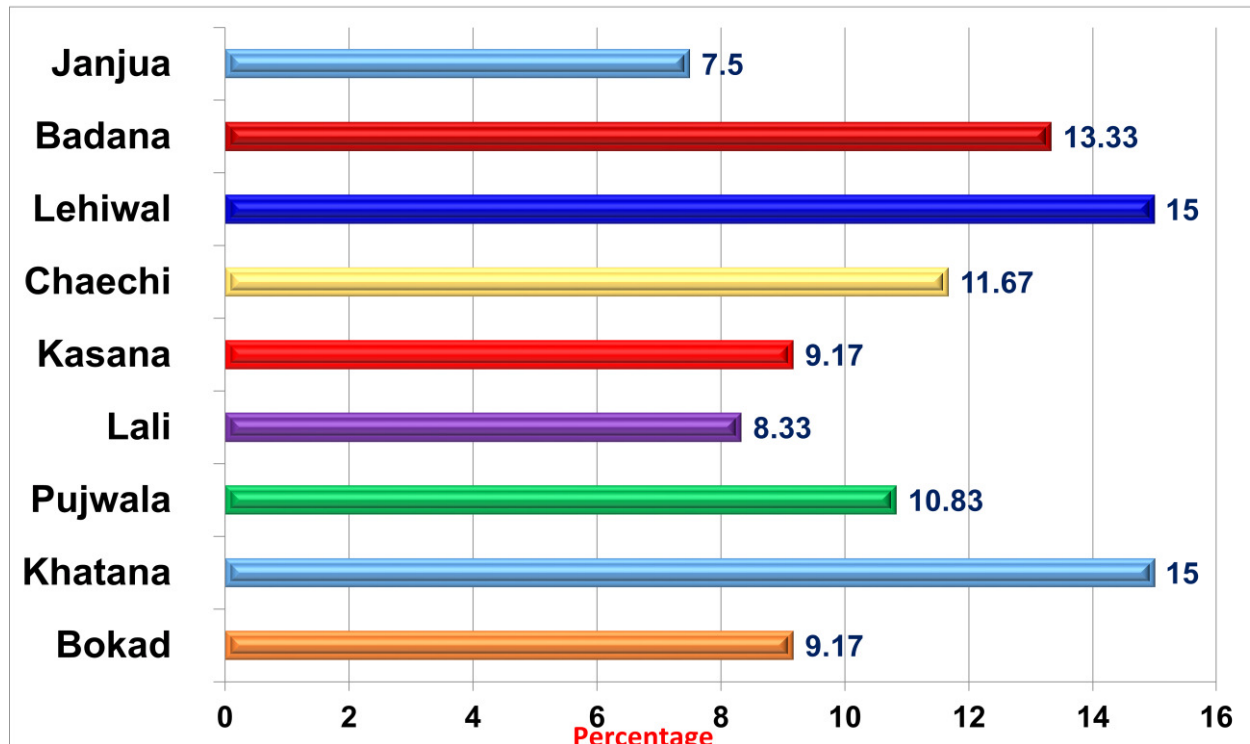


Figure 4.1: Different clans of Bakerwal pastoralists

Beliefs of Bakerwals

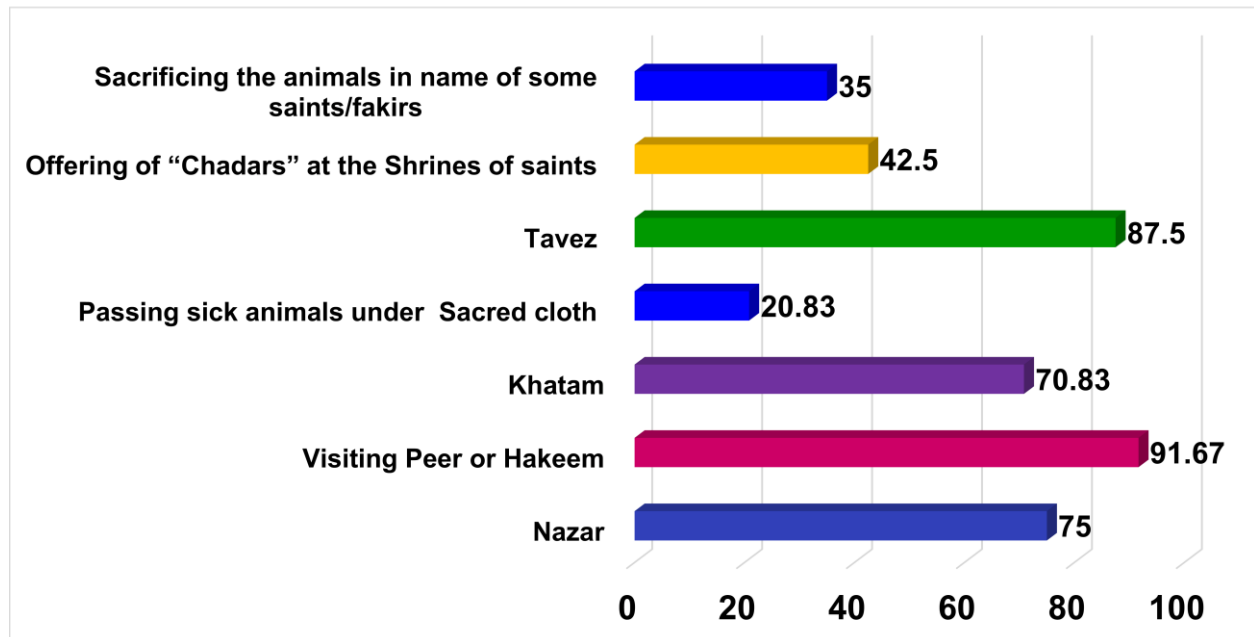


Figure 4.2: Beliefs of Bakerwal pastoralists

(Ramboilet × Local breeds) or Merino (Gaddi, Bhakarwal and Poonchi) crosses and very little Bakerwali breed also. The results of the study as presented in the Table 4.6 clearly elucidate that in the overall livestock holding of the respondents there were 57.40 per cent of Sheep, 37.39 per cent Goat, 0.98 per cent Cattle, 2.87 per cent Equine and 1.36 per cent Dogs. Also it was observed in the study that the average number of Goat per household were 58.72 ± 3.07 and Sheep per household were 123.66 ± 4.39 . Further the number of Cattle, Equine and Dogs per household was 1.86, 5.46 and 2.67 respectively

Table - 4.6: Composition of the livestock holding of the Bakerwal pastoralists

Sl. No.	Species	Proportion of different species	Mean $\pm$ SD	Range
1	Goat	8634 (37.39)	58.72 ± 3.07	5-148
2	Sheep	13252 (57.40)	123.66 ± 4.39	25-232
3	Cattle	226 (0.98)	1.86 ± 0.11	0-5
4	Equine	663 (2.87)	5.45 ± 0.20	3-13
5	Dogs	314 (1.36)	2.67 ± 0.10	1-4

4.2.2 OWNERSHIP PATTERNS OF SMALL RUMINANTS

The respondents interviewed during migration were having flock sizes as big as 750 Goat and Sheep together, but these all animals were not owned by the respondent. The flocks were reported to be belonging to the group of families moving together and thus were having shared ownership in most of the cases. Some small percentage of the respondents had also taken Goat and Sheep of other Bakerwals or local village people for pasturing on contract basis together with their own animals. There were very small Percentage of the respondents who had sole ownership of their flocks.

Table - 4.7: Ownership patterns of Goat and Sheep flocks**n = 120**

Sl. No	Ownership	Number of flocks (%)
1	Owned	5 (4.16%)
2	Shared	107 (89.17%)
3	Taking others	8 (6.67%)

Majority i.e., 89.17 per cent of the flocks had shared ownership i.e., they were collectively owned by a group of related families, who were mostly related by blood and sometimes based on neighborhood and were moving together. There were only 4.16 per cent of the flocks which were solely owned by the respondent (and were moving singly). Further there were 6.67 per cent of the flocks which had shared ownership but were taken by the respondents on contract basis for pasturing.

4.2.3 STRUCTURE OF THE SMALL RUMINANT (GOAT AND SHEEP) FLOCKS

The structure of the flock refers to the various categories of Goat and Sheep in the flock based on the age, sex and reproductive function. Based on these criteria flocks consisted of Kids/Lambs of less than one month age, young males and females of 1-6 months of age, Does/ewes which consisted of adult breeding females, Bucks/rams consisting of adult breeding males and castrates which consisted of castrated males targeted for sales purpose. The results of the study presented in the Table 4.8 and depict that the overall flock of the animals consisted mainly of adult females i.e., does and ewes equaling 39.05 per cent. Kids and lambs constituted 24.30 per cent followed by young females (1-6 months age) and males (1-6 months age) making 8.94 per cent and 8.98 per cent of the overall flocks respectively. Castrates made 16.65 per cent and bucks and rams constituted only 2.08 per cent of the flocks. Among the Goats there were 38.17 per cent of Does, 9.07 per cent of young males, 7.88 per cent of young females and 25.50 per cent of Kids. The Castrates constituted 17.41 per cent and Bucks constituted 1.97 per cent of the goat flock. Among the Sheep there were 39.63 per cent of Ewes, 8.93 per cent of young males,

9.64 per cent of young females and 23.52 per cent of Lambs. The Castrates constituted 16.13 per cent and Rams constituted 2.15 per cent of the sheep flocks.

Table - 4.8: Structure of flocks of the small ruminants

Sl. No	Structure	Goat	Sheep	Goat and Sheep
1	Kids/lambs (Up to 1 month)	2202 (25.5)	3117 (23.52)	5319 (24.30)
2	Young male (1 to 6 month)	783 (9.07)	1183 (8.93)	1966 (8.98)
3	Young female (1 to 6 month)	680 (7.88)	1277 (9.64)	1957 (8.94)
4	Does/Ewes	3296 (38.17)	5252 (39.63)	8548 (39.05)
5	Bucks /Rams	170 (1.97)	285 (2.15)	455 (2.08)
6	Castrates	1503 (17.41)	2138 (16.13)	3641 (16.65)
	Total	8634	13252	21886

4.3 MARKETING PATTERN OF SMALL RUMINANTS

4.3.1 MARKETING PATTERN OR SALE OF SHEEP AND GOAT

Sales Percentage here represents the Percentage out of the total number of animals in each category of Goat and Sheep which were sold by the respondents. The results of the study as presented in the Table 4.9 show that the sales percentage of Does/ewes, castrates, young males, young females and Bucks were respectively 8.84 per cent, 15.52 per cent, 12.81 per cent, 6.09 per cent and 2.64 per cent.

In case of Goats sales Percentage of Does, castrates, young males, young females and Bucks were respectively 10.92 per cent, 16.37 per cent, 10.94 per cent, 5.44 per cent and 2.94 per cent.

Table-4.9: Marketing pattern of animals

Sl. No.	Categories	Goat	Sheep	Goat and Sheep
1	Doe/Ewe	360 (10.92)	396 (7.54)	756 (8.84)
2	Buck/Ram	5 (2.94)	7 (2.46)	12 (2.64)
3	Young male (Up to 6 month of age)	103 (10.94)	167(14.32)	270 (12.81)
4	Young female (Up to 6 month of age)	66 (5.44)	62 (5.11)	128 (6.09)
5	Castrate	246 (16.37)	319 (14.92)	565 (15.52)
	Total	780	951	1731
	Sales Percentage	9.03	7.18	7.91

*Values in the parenthesis are the Percent out of total size in each category

In case of Sheep sales Percentage of Ewes, castrates, young males, young females and Rams were respectively 7.54 per cent, 14.92 per cent, 14.32 per cent, 5.11 per cent and 2.46 per cent. The Table 4.9 further revealed that castrated goat and sheep and young males were sold to the maximum extent and most of the income comes from the sale of these categories of goat and sheep. They did not normally sell the female animals as they from the main asset for the respondents.

4.3.2 MARKETING OF MILK AND MILK PRODUCTS

The Bakerwal produced small quantities of milk from the goats which they mainly used for home consumption and the formation of dairy products. Some of the Bakerwals had also cows for milk purposes. The various milk products formed included Dhahi, Makhan, Ghee, Lassi, Paneer, Kaladi. The Bakerwals don't sell any of the milk or milk products except for small sale of ghee. They mostly consume Dhahi, Makhan Lassi, Kaladi in summer season and keep the Ghee for winter use.

Structure of flocks of Small Ruminants

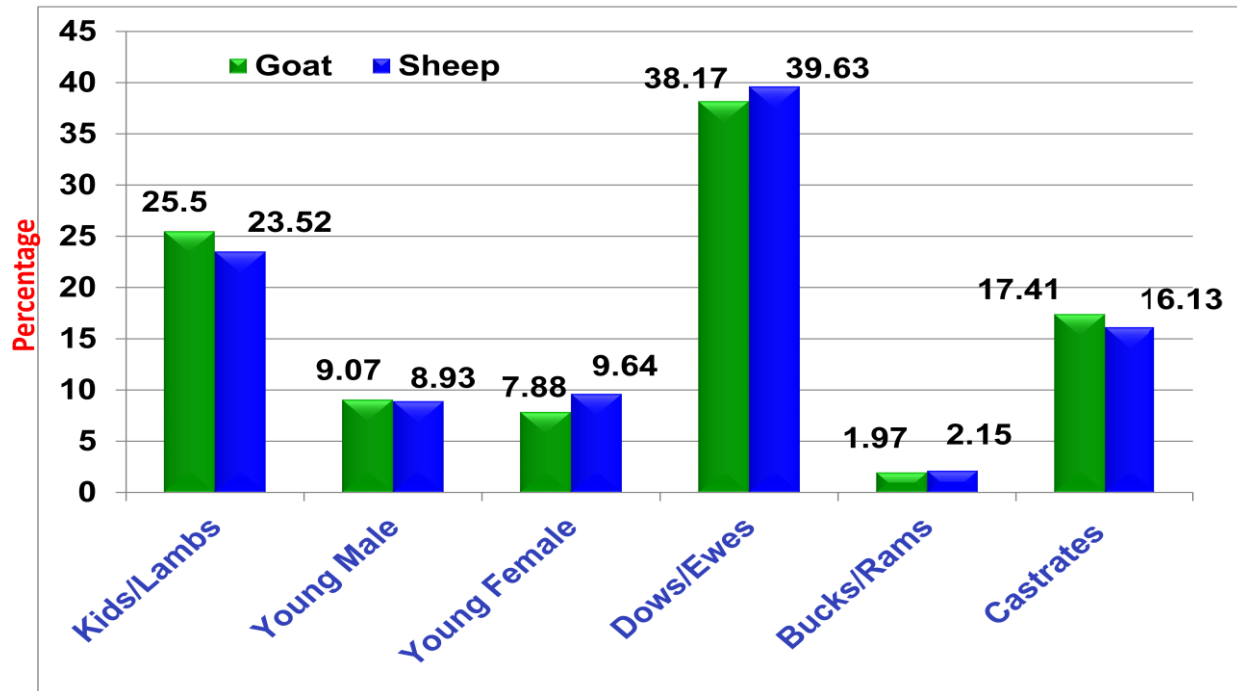


Figure 4.3: Structure of flocks of Goat and Sheep

Marketing Pattern of Animals

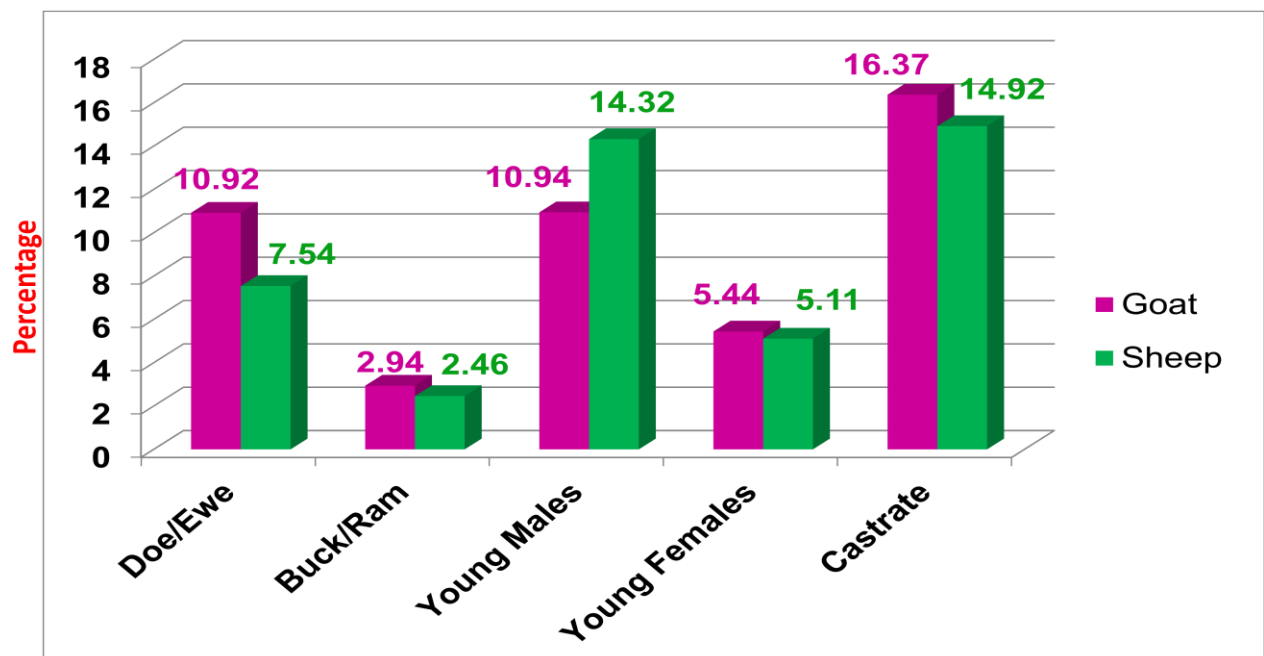


Figure 4.4: Marketing of Goat and Sheep

4.3.3 MARKETING CHANNEL FOR SALE OF SMALL RUMINANTS AND WOOL

4.3.3.1 Marketing channel for the Goat and Sheep

The results of the study presented in the Table 4.10 indicate that six marketing channels were reported among the respondents for the sale of their live animals. It was found in 55.00 per cent of the cases where middleman sold the animals either to Kothdar (11.67%) or Butchers (43.33%) and makes their undue profit.

Table - 4.10: Marketing channel adopted for the sale of live animals & wool

n = 120

Sl. No	Marketing channels	Frequency	Percentage
A	Marketing channel for sale of animals		
1	Bakerwal – Local sale at village level	6	5.00
2	Bakerwal – Local sale on route of migration	15	12.50
3	Bakerwal – Butchers – Consumers	21	17.50
4	Bakerwal – Middlemen/Agent –Kothdar – Butchers- Consumers	14	11.67
5	Bakerwal – Middlemen/Agent - Butchers- Consumers	52	43.33
6	Bakerwal – Kothdar- Butchers- Consumers	12	10.00
B	Marketing channel for sale of wool		
1	Bakerwal – Village trader/shops- Wholesaler	102	85.00
2	Bakerwal – Whole seller	18	15.00

Bakerwals also reported 5 per cent of the animal sale took place in local villages while 12.50 per cent sale occurred directly to the end user who purchased the animal for rearing and/or Eid Qurban (sacrifice) purpose. In 17.50 per cent of the cases the Bakerwals were selling animals to the butchers directly; and through Kothdar to Butchers in 10.00 per cent of the cases. These butchers and Kothdars usually came to the summer and winter pastures for the purchase of animals.

The price of the animal was fixed by the eye ball/visual estimation done by the butchers and Kothdars. At occasion like Eid ul Adha big markets were held at some places where animals were sold after weighing using weighing balance.

4.3.3.2 Marketing channel for the sale of wool

From the results presented in the Table 4.10 it is clear that marketing of the wool was mainly dominated by sale through village traders and shops which account for 85.00 of the purchase of wool. Only a small Percentage of the respondents i.e., 15.00 Per cent were selling wool directly to the wholesalers.

4.3.3.3 Preference exercised by the respondents for the sale of live animals

The study also involved exploring the ranking of the reasons considered by the respondents for the sale of live animals. The results presented in the Table 4.11 clearly show that the topmost priority for the sale involved Bad health condition of the animals. This was followed by kidding and lambing problems, too many of females and males and too heavy animals which were ranked II, III and IV respectively.

Table - 4.11: Reasons of preference for the sale of live animals by the respondents

n=120

Sl. No	Reasons for sale of animals	Weight Score	Weight Score (%)	Rank
1	Too heavy animals	423	58.75	IV
2	Very old animals	629	87.36	V
3	Lambing and kidding problems	327	45.42	II
4	Unwanted physical features (physical deformities)	264	36.67	VI
5	Too many males/females	233	32.36	III
6	Bad health conditions	644	89.44	I

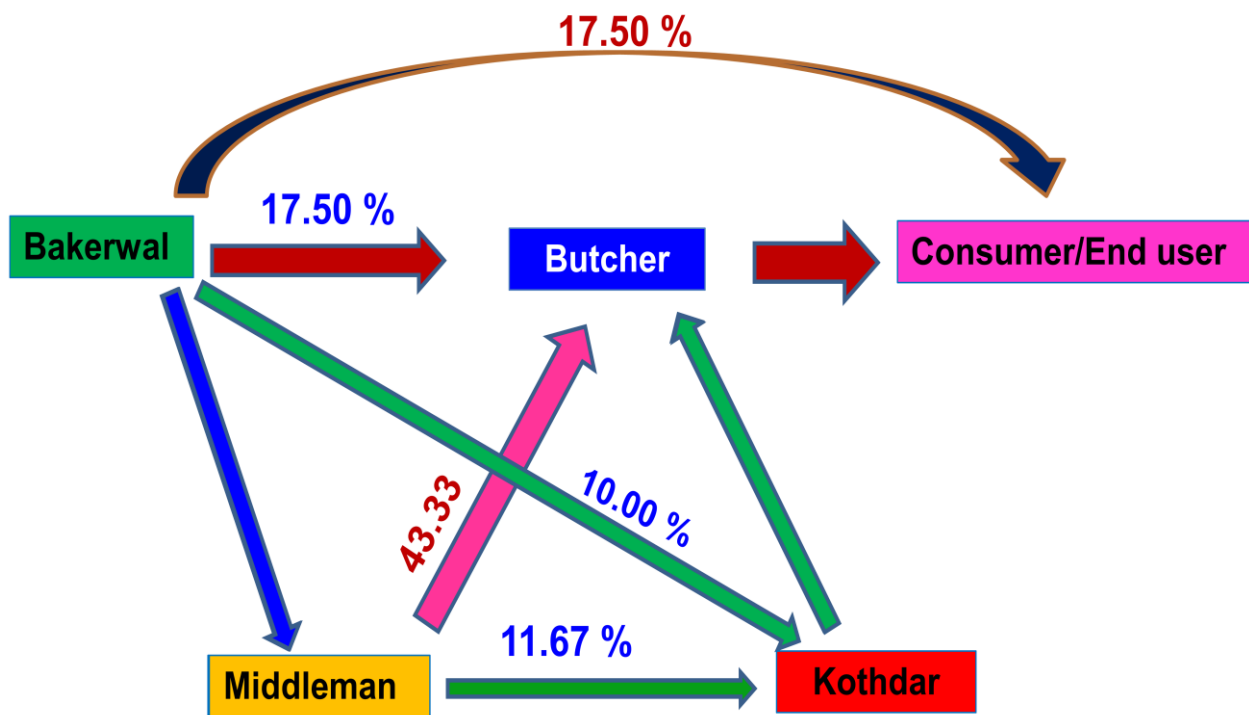


Figure 4.5: Marketing channels in sale of live animals

Wool Sale

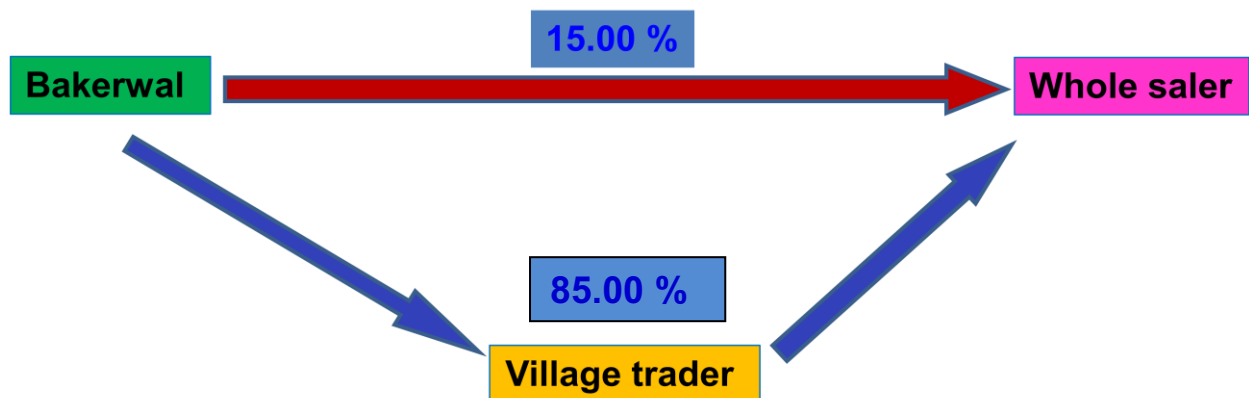


Figure 4.6: Marketing channels in sale of wool

Besides this the other reasons were very old animals and animals with unwanted physical feature (physical deformities). While interaction with Bakerwals it was observed that they sold the live animals to the tune of 7.91 per cent only because the flocks were there only assets and insurance for the future security.

4.4 MIGRATION ASPECTS OF BAKERWAL PASTORALISTS

The Bakerwal pastoralists were residing in the plains and lower hills of Jammu region during winters. With the onset of the summers they start migration towards alpine and subalpine pastures in the Kashmir valley. They reach their summer pastures by mid of May or mid of June months. Some pastures were located in the Kishtwar district of Jammu, but Bakerwals reach these pastures through Kashmir valley. Some Percentage of pastoralists migrates to the areas of Doda and Baderwah districts where they pasture their animals during summer. Some Bakerwals even don't move to either Kashmir valley or Doda-Baderwah region but manage the grazing of their flocks in the some hilly regions like Patnitop etc. during summers.

4.4.1 ROUTE OF MIGRATION

An effort was made to draw the route of Bakerwal migration from winter pastures to summer pastures and vice versa. Information about the routes was also obtained from Sheep Husbandry Department, Jammu. The routes of migration of the respondents were noted as under:

Route 1: Rajouri – Nowshera – Leerawali - Peer Gali – Aliabad – Dobiwan – Hirpur (Budgam)

Route 2: Mogla- Kalakote – Budhal – Kavsarnag – Aharbal – Shopian – Pampore – Shalimar – Ganderbal – Kangan- Sonamarg – Minamarg – Zojila – Drass – Kargil

Route 3: Akhnoor – Pambla – Kanthan – Lapri – Gool – Sarkanta Dhar – Mohu – Jawahar Tunnel – Very Nag – Achabal – Batkot – Pahalgam – Chandanwari

Route 4: Tikri – Sansu – Kainath Gali – Sanasar – Ladha Dhar – Banihal - Jawahar Tunnel – Very Nag – Vailoo – Mati – Margan – Incian – Afti

Route 5: Hiranagar – Koota – Ramkot – Mansar – Surinsar – Jaganu – Cheneni – Batote – Thathri – Patimahal – Sirishi – Hanzal – Yardu – Sarkandu – Incian

Route 6: Jandrota – Bhoond – Bani – Sarthal – Chatar Gali – Jai – Gandoh – Dodhar – Michale – Sunchain – Padam – Zanaskar – Kabanala

4.4.2 DISTANCE

Different routes had variable distances between initial (winter pasture) and final destinations (summer pastures). Route number 1 was the shortest one with a distance of 130 kilometers and route number 2 was the longest one with a distance of 280 kilometers. Routes 3, 4, 5 and 6 were 200, 160, 255 and 200 kilometers respectively.

Table - 4.12: Distance, Duration, Timing and number of halts during migration

Route	Distance (Kms.)	Duration (Days)	Up migration	Down migration	Number of Transits	Days at each transit
1	130	40	Mid April	Mid Sept	3	4 – 5 days depends on various factors
2	280	60	Mid April	Mid Sept	7	
3	200	60	Mid March	Mid Sept	4	
4	160	50	Mid March	Mid Sept	6	
5	255	65	Mid March	Mid Sept	5	
6	200	55	Mid March	Mid Sept	5	

4.4.3 DURATION

The results of the study presented in the Table 4.12 show that the time (in number of days) taken by the respondents to travel between winter and summer pastures varies along different routes. They were taking a time of 40 to 65 days along different routes. The number of days taken along each route had been shown in the Table 4.12. It was observed that time variability depended on the number of factors like the distance between the initial and final destinations, climatic or weather

Routes of Migration

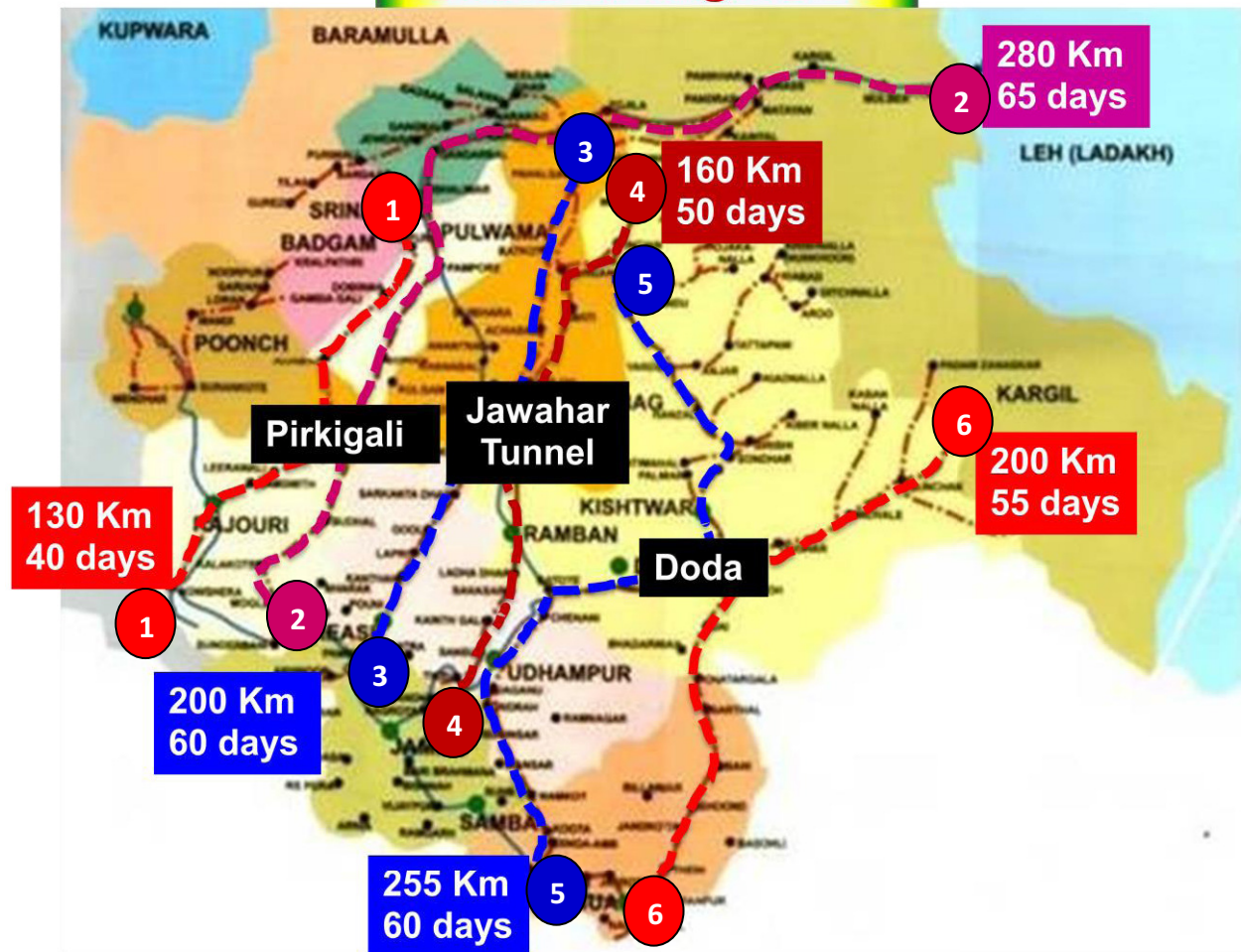


Figure 4.7: Major Routes of Migration of Bakerwal Pastoralists

conditions prevalent in the area and also availability of feeds and fodders along the route of migration. Sometimes migration gets delayed due to snow or bad weather conditions in valley or along the migration route while sometimes the migration has to be started early due to early rise in the temperature in Jammu region. During the course of investigation it was explained by the respondents that sometimes temperature rises early and the migration unfortunately routes were not yet cleared for migration, this was the real challenging period for Bakerwals when huge mortality occurs due to combined effect of weather conditions and scarcity of feeding resources.

4.4.4 MONTH /TIMINGS OF MIGRATION

During the study it was observed that the migration starts from Jammu during the mid of March among most of the respondents to mid of April among others. They start it when the temperature starts rising up and the animals mainly sheep start feeling uncomfortable due to heat. The decision to start migration also depends on the condition of migration route.

The down migration starts from mid-September to early/first week of October when the temperature in the summer pastures falls too much and at some times snowing also starts. By the end of November or first week of December they reach back their winter pastures.

4.4.5 NUMBER OF TRANSITS AND DAYS OF STAY AT EACH TRANSIT

During migration the Bakerwals graze/browse and move their animals during the day and take a night stay along the migration routes. Every day they travel an average distance of .8-10 kilometers. After continuous travel for 4 or 5 days they stay at transit points for 4 or 5 nights for feeding their animals and providing rest to their animals and themselves.

These transit points have a good grass and are mainly hilly areas. The number of transit points varies along different routes of migration and vary from 3 to 7 as shown in the Table 4.12.

4.4.6NUMBER OF FAMILIES MOVING TOGETHER

The results of the study showed that the Bakerwals usually move in Qafilas/family groups together. Each group consists of two to six families. This group movement helps them to ensure a safe journey towards summer or winter pastures and to overcome any untoward happening whether climatic or any other together. The results presented in the Table 4.13 clearly show that 41.67 per cent of the Qafilas/family groups consisted of five families. This was followed by 27.50 per cent of the Qafilas consisting of four families and 15.00 per cent of Qafilas consisting of six families. There were only 5.00 per cent of Qafilas consisting only two families.

Table - 4.13: Distribution of respondents according to the number of families moving together, livestock mobility and family migration with flock

n=120

Sl. No	Characteristics	Frequency
A	Number of families moving together	
	Two	6 (5.00)
	Three	13 (10.83)
	Four	33 (27.50)
	Five	50 (41.67)
	Six	18 (15.00)
B	Livestock mobility	
	Nomadic	41 (34.17)
	Transhumance	74 (61.67)
	Sedentary	5 (4.16)
C	Migration of family with the flock	
	Full family migration	78 (65.00)
	Young families move with children but old age members stay at home	42 (35.00)

Figures in parenthesis indicate the Percentage



Plate No. 1 Migration of Bakerwal Pastoralists





Plate No. 2 Camping of Bakerwal Pastoralists during Migration



4.4.7BAKERWAL MOBILITY

The mobility of the Bakerwal pastoralists may be either of nomadic, transhumant or sedentary types. Actually no true nomadism and transhumant pastoralism was found among Bakerwal pastoralists. In nomadic type they have no fixed location in the winter pastures in Jammu and keep on moving while in case of transhumant type of mobility they have fixed locations of winter and summer stay. The results of the study as presented in the Table 4.13 clearly show that majority i.e., 61.67 per cent of the respondents were having transhumant type of mobility pattern while 34.17 per cent of the respondent where nomadic one. Only 4.16 per cent of the respondents were of sedentary type. While data collection it was noticed that the transhumant and nomadic types lived in tents while as the sedentary ones have their houses made in winter pastures or in Kashmir valley. Some of the Bakerwals have made mud kaccha houses in the summer pastures which they mend every year to make it suitable for their living.

4.4.8FAMILY MIGRATION WITH FLOCK

The study also reported the pattern of family migration with the flocks of goat and sheep. The results of the family migration with the flock as indicated in the Table 4.13 show that in majority i.e., 65.00 per cent of the cases full family moved with the flock while as in 35.00 per cent of the cases only young families moved with the flocks and the elders stayed at their permanent locations either in Jammu or Kashmir divisions.

4.4.9REASONS OF MIGRATION

The study also investigated the reasons of migration of Bakerwal pastoralists and it is clearly evident from the results presented in the Table 4.14 that first and foremost reason for migration as expressed by the Bakerwals was searching of feeding resources. The second most important reason was the extreme weather conditions; extreme cold in Kashmir during winters and extreme hot in Jammu during summers; and it was closely followed by traditional practice. The third important reason as expressed by the Bakerwals was extreme weather conditions. Fourth reason expressed for the migration was better marketing opportunity and the fifth important

reason was income from taking others animals for pasturing during summer months where there is huge availability of pastures.

Table - 4.14: Reasons of migration according to perception of respondents
n=120

Sl. No	Particulars	Weight Score	Weight Score (%)	Rank
1	Extreme weather conditions	480	69.00	II
2	Traditional practice	392	65.33	III
3	Better marketing	350	58.33	IV
4	Availability of feeding resources	416	80.00	I
5	Income from animal hiring	162	27.00	V

4.4.10 SOURCES OF VETERINARY TREATMENT ACROSS MIGRATION

The study also investigated the sources of veterinary treatment during the course of migration. It was observed during the survey as presented in the Table 4.15 that self-medication/treatment was invariably done by all the Bakerwals using local ethno veterinary practices. It is clear from the Table 4.15 that only self-treatment was done by 35.83 per cent of the respondents. This was followed by 30.00 per cent of the respondents who got their animals treated from mobile clinics besides doing self-treatment. There were also 14.17 Per cent of respondents who got advice from fellow Bakerwals for treatment besides doing self-medication. Finally there were 20.00 per cent of the respondents who got their animals treated from quacks besides doing self-medication.

4.4.11 PROBLEMS FACED BY THE BAKERWALS DURING MIGRATION

The migration of flocks involves the travel through commonly un-trodden paths/terrains and passes through forests and mountains where there were very less human interactions and lack of various social services and facilities. The study also investigated the various problems faced by the Bakerwals during migration.



Plate No. 3 Goat taken for distress sale and middle man involvement





Plate No. 4 Carrying sick animal & Ethno veterinary treatment enroute





Plate No. 5 Mortality caused by unpredictable weather



Table - 4.15: Distribution of respondents according to Sources of veterinary treatment across migration

n=120

Sl. No	Sources of treatment	Frequency (%)
1	Only Self medication	43 (35.83)
2	Quacks + Self medication	24 (20.00)
3	Fellow + Self medication	17 (14.17)
4	Mobile clinic and Self medication	36 (30.00)

The results of the study are presented in the Table 4.16 which indicates that the topmost problem faced by the Bakerwal pastoralists during migration was lack of shelter for the animals and humans, which severely affected them and their animals in case of any untoward extreme weather conditions.

Table - 4.16: Problems during migration as experienced by the respondents

n=120

S. No	Problems	Weight Score	Weight Score (%)	Rank
1	Occurrence of disease during migration	612	63.75	II
2	Lack of veterinary facility	604	62.92	III
3	Lack of shelter for the animals and humans	854	88.96	I
4	Carrying animals fallen sick during migration	528	55.00	V
5	Predator problem	448	46.67	VI
6	Abortions in Does/Ewes due to stress	400	41.67	VII
7	Theft of animals	282	29.38	VIII
8	Restriction of entry of animals in particular village	592	61.67	IV

Occurrence of disease during migration and the lack of veterinary facility along the route of migration were the second and third ranking problems faced by the respondents. Further restriction of entry of animals in particular forest/village was ranked fourth, carrying animals fallen sick during migration, fifth; and predator problems was ranked sixth by the respondents among the various problems faced during migration. Abortions due to stress and theft of animals were other problems reported by the respondents of the study area.

4.5 MANAGEMENT PRACTICES OF SMALL RUMINANT REARING AMONG BAKERWAL PASTORALISTS

4.5.1 FEEDING MANAGEMENT OF GOAT AND SHEEP DURING DIFFERENT PHASES OF MIGRATION

The feed resources for animals available to Bakerwals varied during different phases of migration. During migration the feeding resources mainly consisted of communal grazing and browsing, route side grazing and grazing aftermaths. Grazing aftermaths included stubble feeding in paddy and wheat fields after the main crop was harvested. In summers the main source of feeding was communal grazing lands in alpine and subalpine pastures. During winters the animals fed on communal grazing and browsing besides using private lands in some part of winters.

During both up and down migration, all the Bakerwals (100.00) maintained their goat and sheep on communal and route side grazing and browsing. Depending on the availability 10.00 per cent of Bakerwals were also grazing their animals with grazing aftermaths like stubbles in harvested paddy and wheat fields during migration. During the summer months all the Bakerwal allowed their goat and sheep for communal grazing and browsing in the hills and subalpine and alpine pastures. A very small percentage i.e., 4.17 per cent don't reach to the sub alpine and alpine pastures but stayed in hills in the villages of the Kashmir valley or Jammu and feed their animals with crop residues and tree lopping in addition to the communal grazing and browsing.

Table - 4.17: Feed sources available to small ruminants during different phases of migration

n=120

Sources of Feed	Upward Migration (Mar-June) Downward Migration (Sept-Nov)	Summer (May- Sept)	Winter (Nov-Mar)
Communal grazing/Browsing	120 (100.00)	120 (100.00)	120(100.00)
Route Side Grazing/ Browsing	120 (100.00)	0 (0.00)	0 (0.00)
Grazing aftermaths	12 (10.00)	5 (4.17)	0 (0.00)
Crop Residues	0 (0.00)	5 (4.17)	22 (18.33)
Conserved Feeds	0 (0.00)	0 (0.00)	25 (20.83)
Fodder Leaves/Lopping	0 (0.00)	5 (4.17)	72 (60.00) _{Goat}
			8 (6.67) _{Sheep}
Additional feeding			
Concentrates	0 (0.00)	0 (0.00)	30 (25.00)
Salt feeding (Average per animal)	Sometimes	50g/ week	50g/2 week

In summer pastures there was ample supply of feeding materials and Bakerwals reported that their animals gained a very good weight due to good feeding resources during summer phase of migration. Since the availability of the feeding resource was very meager during the later months of winter especially during mid-January to mid-march.

A cursory look at the Table 4.17 revealed that 20.83 per cent of the respondents provided animals with the conserved feeds rice straw, wheat straw etc. and 18.33 per cent of the respondents provided crop residues to their goat and sheep to supplement their winter feeding during this part of the year. Other than this 60.00 per cent of the respondents provided fodder leaves and loppings to their goats and only 6.87 per cent of the respondents provided leaves and loppings to their sheep. The Bakerwals had to buy these leaves and loppings from the people owning the trees. The respondents had to pay an amount of money to the owner of the land and make a contract for a period of time.

The amount paid was dependent on the number of animals in the flock and number of days of grazing/ browsing. Concentrate feeding was done only during winters by 25 per cent of the respondents who fed their animals with maize particularly the lactating animals at the rate of 200 gram per animal for about one month. Salt feeding was done at the rate of 50 grams per animal after every week in summers and every two weeks in winters. During migration salt feeding was done only sometimes.

4.5.1.1 Type of grazing

Generally the goats and sheep were grazed together (mixed species) in winters and in summer pastures while during migration they were grazed generally separately (single species). This single and mixed species grazing enables efficient utilization of the available feeding resources. The results of the study as presented in the Table 4.18 clearly reveal that in winters the majority of the respondents i.e., 75.00 per cent adopted mixed species grazing but 25.00 per cent adopted single species grazing. While during migration the scenario was different during which 75.00 per cent of the respondents adopted single species and 25.00 per cent adopted mixed species grazing. In summers 79.17 per cent of the respondents adopted mixed species and 20.83 per cent adopted single species grazing. They followed single species grazing to utilize more of the lesser feeds available during migration.



Plate No. 6 Grazing, Browsing and Stubble feeding migration



Table - 4.18: Grazing type and grazing times in different phases of the year**n= 120**

SI No	Parameters	Migration	Summer	Winter
A	Type of grazing			
1	Single species	90 (75.00)	25 (20.83)	30 (25.00)
2	Mixed species	30 (25.00)	95 (79.17)	90 (75.00)
B	Grazing time			
1	Timing (Range)	7 am - 12 noon 4 pm to 6 pm	8 am -7 pm	9 am - 5 pm
2	Grazing hours (average)	7 hours	11 hours	8 hours

4.5.1.2 Grazing Time

The data was further analyzed and it was found as presented in the Table 4.18 that during migration the animals were started to move and graze at 7.00 am to 12.00 noon. Then the animals were provided rest and protection from the sun till 4.00 pm. After which the animals were again started to move and graze till 6.00 pm when they were stopped for the night rest. In this way the grazing hours during migration were 7 hours in total; 5 hours in first spell and 2 hours in the second spell. During summers in pastures the grazing hours were much longer i.e., 11 hours a day. The animals were left out for grazing at 8.00 am in the morning to 7.00 pm in the evening. Ad lib grazing and browsing was allowed in summer by the respondents. During winters all the respondents took their animals for grazing around 9.00 am in the morning and brought them back near their tents around 5.00 pm in the evening and thus allowing a grazing time of about 8 hours.

4.5.1.3 REASONS FOR SHORTAGE OF FEEDS DURING THE YEAR

The study also investigated the reasons for the shortage of feeding resources faced by the respondents during any phase of migration. Majority of the respondents reported feed shortage problem during migration followed by problem in winter and least in summer pastures. The results of the study as presented in the Table 4.19 indicated that shrinkage of grazing lands due to encroachments was the top most reason for the shortage of the feeding materials for the animals during migration and in winter season. The protection on grazing lands (forests and other reserves) for wild life conservation and forest protection was the second ranking reason for the shortage of feeding resources during migration. Geopolitical tensions were ranked at third position. This was followed by over grazing due to increased grazing pressure or increase in animal population/unit land which was ranked four and decline in productivity of grazing lands which was ranked fifth. The productivity of the lands declined due to replacement of good grasses with less preferred ones as expressed by the respondents.

Table - 4.19: Reasons for Shortage of Feeds during the year

Reasons	Weight Score	Weight Score (%)	Rank
Shrinkage of grazing lands	453	75.50	I
Decline in productivity of grazing lands	287	47.83	V
Over grazing	300	50.00	IV
Protection on grazing lands	433	72.17	II
Geo political reasons	425	70.83	III

4.5.1.4DISTANCE TRAVELLED TO REACH WATER SOURCES FOR ANIMALS

The respondents did not report any shortage of water sources though they complained of distances to be walked to reach water sources in the winter locations. The results of the study as presented in the Table 4.20 clearly show that in winters, the majority of the respondents i.e., 55.00 per cent had to travel a distance of 1 to 3 Km and 31.66 per cent of the respondents had to travel a distance of 3 to 5 Km to reach the water sources. There were 6.67 per cent of the respondents who had to travel a distance of 5 to 8 Km and another 6.67 per cent who had to walk less than 1 Km to reach the water sources for their animals.

In summer season majority of the respondents reported nearness to the water sources for their animals. A majority i.e., 70.00 per cent of the respondents had to travel a distance of 1 to 3 Km to reach water sources and 22.50 per cent had water sources within 1 Km range. For 7.50 per cent of the respondents; they had to travel a distance of 3 to 5 Km for watering their animals during summer months.

Table - 4.20: Watering Pattern of animals in different phases of migration

n=120

Sl No	Parameters	Summer	Winter
A	Distance Travelled for water		
1	< 1 km	27 (22.50)	8 (6.67)
2	1 to 3 km	84 (70.00)	66 (55.00)
3	3 to 5 km	9 (7.50)	38 (31.66)
4	5 to 8 km	0 (0.00)	8 (6.67)
B	Frequency of watering		
1	Once	---	120 (100.00)
2	Twice	100 (83.33)	---
3	Thrice	20 (16.67)	---

4.5.1.5 Frequency of watering animals

The frequency of watering the animals was found varying with the season. The results of the study presented in Table 4.20 showed that the frequency of watering animals in winters was only once a day preferably at noon; as water requirement is less during winters. Whilst in summers majority of the respondents i.e., 83.33 per cent watered their animals twice and even 16.67 per cent watered their animals thrice during the day.

4.5.2 BREEDING AND REPRODUCTIVE PERFORMANCE

4.5.2.1 Criteria of selection for bucks and rams

During the course of investigation it was observed that the respondents selected the bucks and rams for breeding purposes based on varying criteria. The selection criteria adopted was same for both goat and sheep and this selection was done at the time of castration of kids and lambs. As is evident from the results presented in the Table 4.21, the majority i.e., 75.00 per cent of the respondents selected breeding bucks and rams based on general appearance which included factors like good general health condition, strong legs, good growth rate and grazing/browsing pattern.

The ram should be close grazer and the buck should have good browsing abilities. Besides they also select for white fleece color of rams against black color. The study also reported 15.00 per cent of the respondents; who choose bucks and rams based on general appearance and pedigree together. In pedigree they preferred breeding males who were progeny of good milking dams in case of goats and in rams the parents should have had wool of good quality.

Further there were 10.00 of respondents who looked for progeny characteristics also in addition to above mentioned criteria. If they found that the progeny of some selected buck or ram was not performing well, then they immediately culled that breeding animal.

Table 4.21: Criteria for selection of bucks/ rams for breeding purposes**n=120**

SI No	Criteria / characteristics	Number (%)
1	General appearance	90 (75.00)
2	General appearance + Pedigree	18 (15.00)
3	General appearance + Pedigree + Progeny characteristics	12 (10.00)

4.5.2.2 Season for intense breeding

The goat and sheep are short day breeders and their females come in heat as the day length decreases. The male are found to be more active in the pastures in autumn season where they have good and ample availability of feed resources. A majority i.e., 68.33 per cent of the respondents reported that intense breeding occurred in autumn season (Aug to Sept) and followed by 31.67 per cent of respondents who reported spring (Feb to Mar) as the intense season for breeding.

Table-4.22: Seasons for intense breeding and kidding/lambing**n=120**

SI No	Breeding season	Frequency (%)
1	Autumn (Aug - Sept)	82 (68.33)
	Spring (Feb-Mar)	38 (31.67)
2	Kidding/Lambing season	Frequency (%)
	Winter (Jan - Feb)	82 (68.33)
	Summer (Jul - Aug)	38 (31.67)

4.5.2.3 Season for intense kidding and lambing

The gestation period of goat and sheep is about five months and one week. Based on the seasonality of the breeding season there was also some sort of seasonality in the kidding and lambing season. However, seasonality was not too strict as the kidding and lambing occur in other months at different phases of migration also. The results of the study as presented in the Table 4.22 indicated that in majority of the respondents i.e., 68.33 per cent kidding occurred in winter season (Jan to Feb) followed by 31.67 per cent of the respondents who reported intense kidding and lambing season during summer (Jul to Aug).

4.5.2.4 Age at first Kidding and Lambing in small ruminants

During the study it was found that the Sheep attains maturity at younger age compared to the Goat among the migratory flocks of Bakerwals.

Table - 4.23: Age at first kidding and lambing in small ruminants

n=120

SI No	Goat		Sheep	
	Age in months	Frequency (%)	Age in months	Frequency (%)
1	<20.44	38 (31.67)	< 18.41	39 (32.50)
2	20.44 – 24.03	54 (45.00)	18.41 – 21.78	50 (41.67)
3	> 24.03	28 (23.33)	> 21.78	31 (25.83)
Range		15-30 Months		15-24 Months
Mean $\pm$ SD		21.80 $\pm$ 3.27		20.16 $\pm$ 3.06

The results of the study indicated that in case of Goat 45.00per cent of the respondents reported that the age at first kidding was 20.44 to 24.03 months. This was followed by 31.67per cent of respondents who reported first kidding age of less than 20.44 months and 23.33per cent of respondents who reported the first kidding

age of more than 24.03 months. The results of the study in case of sheep indicated that 41.67 per cent of the respondents reported that the age at first lambing was 18.41 to 21.78 months. This was followed by 32.50 per cent of respondents who reported age of less than 18.41 months at first lambing and 25.83 per cent of respondents who reported the first lambing age of more than 21.78 months. Further ranges of the age at first kidding and lambing in goat and sheep with have been shown in the Table 4.23.

Mean age of kidding and lambing reported in Goat and Sheep respectively was 21.80 ± 3.27 months and 21.16 ± 3.06 months.

4.5.2.5 Kidding and lambing rate, twinning rate, kidding/lambing interval and mortality rate in kids and lambs

The study investigated the number of births of kids and lambs per year, number of twinning's in each of the selected flocks to calculate the kidding/lambing rate and twinning rate. It also studied the kidding/ lambing interval and also the kid and lamb mortality rates by knowing the number of kid and lamb deaths for each respondent. The results of the study as presented in the Table 4.24 show that the number of Does parturited in all the selected flocks were 2047 out of 3296 breeding Does indicating a kidding rate of 62.11 per cent. Similarly in case of sheep the number of Ewes parturited in all the selected flocks was 3135 out of 5252 number of breeding ewes making a lambing Percentage of 59.69. The kidding /lambing rate was calculated by the formula (no. of partirutions divided by the number of adult breeding animals $\times 100$). Regarding the number of twinings, the total twinning's reported in case of goat was 73 and in case of sheep was 53. Thus the twinning rate was 3.57 per cent in case of goats and 1.69 per cent in case of sheep. Twining Percentage (rate) was calculated by multiplying 100 to the ratio of number of cases of twinning's to the total number of cases of kidding/lambing. However all the respondents reported only one kidding and lambing per year in case of the does and ewes respectively. Thus the kidding or lambing interval was one year. During the discussion it was elaborated that if there is better feeding management one can get three kidding in two years.

Table - 4.24: Number of births, twinning's, kidding/lambing per year and kid/lamb mortality in small ruminants

SI No	Parameter	Goat		Sheep	
		Number	Percentage	Number	Percentage
1	Number of females parturited (kidding/lambing rate)	2047	62.11	3135	59.69
2	Number of twinning's	73	3.57	53	1.69
3	Kidding/lambing interval	1 year		1 year	
4	Mortality of kids/lambs	407	19.20	514	16.12

On enquiring about the kid and lamb mortality it was observed that there were very high mortality rates. In case of kids it was reported to be 19.20 per cent and in lambs to be 16.12 per cent. The kid/lamb mortality was calculated by multiplying 100 to the ratio of number of kids/lambs died to the number of kids/lambs born. The mortality in case of kids was more because stresses due to feed shortage and cold weather and also due to reason that twins in goat are generally weak.

4.5.3 HEALTH CARE MANAGEMENT OF GOAT AND SHEEP FLOCKS OF BAKERWAL PASTORALISTS

The study also investigated the morbidity and mortality caused in Goat and Sheep due to commonly occurring diseases in the study area. The study reported that commonly occurring diseases in goat and sheep were PPR (Sari), CCPP (Budi), Enterotoxaemia (Kamni) and FMD (Mokhur). The diseases like pneumonia (Budi), Sheep pox (Thandi/Chechak) and Foot rot (Paer ka Mokhur) were commonly found in Sheep only. Besides these, parasitic diseases and poisoning were also common among the goat and sheep flocks of Bakerwals.

The results of the study as presented in the Table 4.25 indicate that the highest morbidity i.e., 22.11 per cent in case of goat was occurring due to parasitic infestations. This was followed diseases like PPR, ET, CCPP, poisoning and FMD causing 12.70 per cent, 7.99 per cent, 6.87 per cent, 5.05 per cent and 1.24 per cent of morbidity in goats; respectively. However highest mortality in goat was reported to be due to Enterotoxaemia having mortality rate 3.57 per cent. This was followed by diseases like PPR, CCPP, Poisoning, FMD and parasitic diseases respectively having mortality rates of 0.95 per cent, 0.83 per cent, 0.49 per cent and 0.47 per cent. The overall mortality rate in goats was 6.60 per cent.

Table 4.25: Morbidity and mortality due to common diseases in small ruminants

Sl. No	Diseases	Goat		Sheep	
		Morbidity	Mortality	Morbidity	Mortality
1	PPR (Sari)	12.70 (1097)	0.95 (82)	4.80 (636)	0.87 (115)
2	CCPP/ Pneumonia (Budi)	6.87 (593)	0.83 (72)	4.06 (538)	0.77 (102)
3	Enterotoxaemia (Kamni)	7.99 (690)	3.57 (308)	12.99 (1721)	6.75 (895)
4	FMD (Mokhur)	1.24 (107)	0.47 (41)	1.56 (207)	0.31 (41)
5	Parasites	22.11 (1909)	0.27 (23)	32.10 (4253)	0.34 (45)
6	Poisoning	5.05 (436)	0.49 (42)	6.72 (891)	2.28 (302)
7	Pox (Goat/Sheep) (Thandi)	6.15 (531)	0.41 (35)	22.37 (2964)	0.43 (57)
8	Foot rot (Pair Ka Mokhur)	***	***	28.12 (3726)	0.15 (17)

Figures in parenthesis indicate Percentage

Further the results of the study shown in the Table 4.25 clearly depict that the highest morbidity i.e., 32.10 per cent in sheep was caused due to parasitic infestations. This was followed by foot rot, sheep pox and Enterotoxaemia causing 28.12 per cent, 22.37 per cent and 12.99 per cent of the morbidity. The diseases like poisoning and pneumonia were causing for 6.72 per cent and 4.06 per cent of the morbidities respectively. Morbidity due to FMD was only 1.56 per cent.

The highest mortality in the sheep was occurring due to Enterotoxaemia, having a mortality rate of 6.75 per cent. This was followed by mortality due to poisoning and pneumonia having mortality rates of 2.28 per cent and 0.77 per cent respectively. The other diseases like sheep pox, parasitic diseases, FMD and foot rot have comparatively less mortality rates of 0.43 per cent, 0.34 per cent, 0.31 per cent, 0.15 per cent respectively. The overall mortality rate for the sheep were reported to be 11.04 per cent. The much higher overall morbidity rate in sheep is due to high incidence of foot rot disease affecting large number of sheep.

4.5.3.1 Ethno-veterinary practices used by Bakerwals pastoralists

The Bakerwals were found doing self-treatment of the sick animals in majority of the cases as they were lacking access to veterinary services at many of the places they live, due to their migratory mode of life. An attempt was made to document the Ethno veterinary practices followed by the Bakerwal pastoralists in treatment of their animals. The Table 4.26 presented below shows various common diseases of Goat and Sheep and the treatments done by Bakerwals by using locally available resources.

Table-4.26: Ethno-veterinary practices used by Bakerwals for treatment of various diseases of their animals

Sl. No	Disease	Method and mode of application
1	Indigestion	50 g of tea boiled with 1 litre of water till the volume is reduced to 250 ml. The solution is then drenched to animal @ 50 ml two times a day for three days.

Morbidity and Mortality in Goat

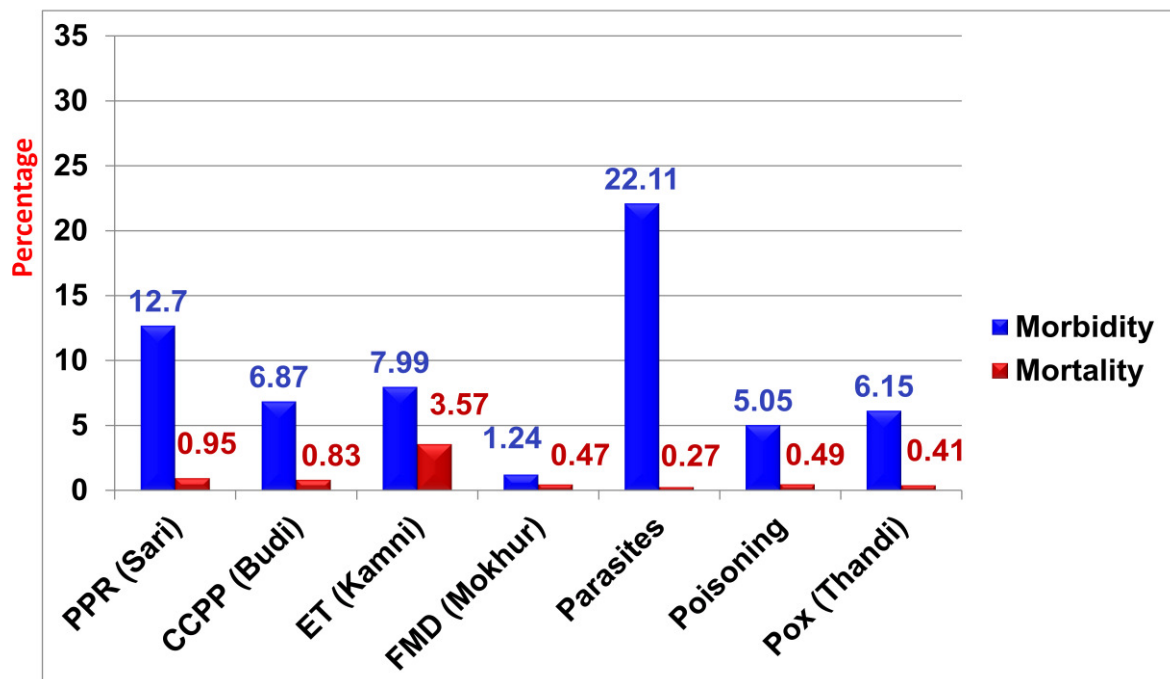


Figure 4.8: Mortality and morbidity in Goat

Morbidity and Mortality of Sheep

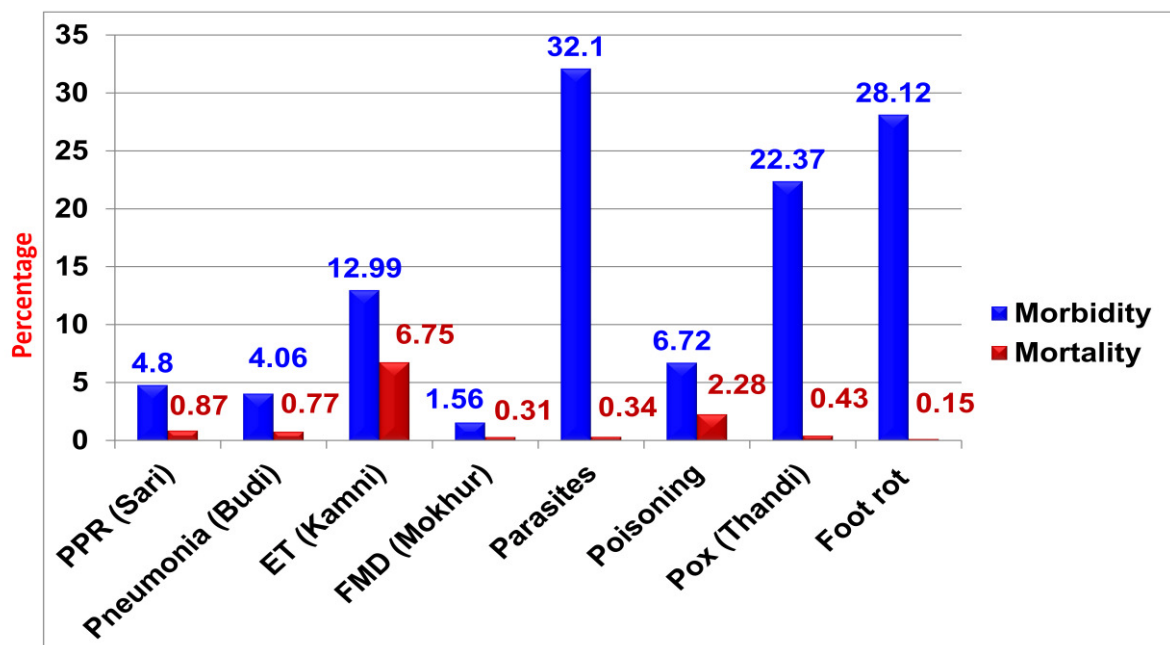


Figure 4.9: Mortality and morbidity in Sheep

		10 g Ajwain (<i>Trachyspermum ammi</i>) mixed with 500 ml of mild hot water and fed to animal two times a day for 2-3 days
2	Diarrhoea	10-12 leaves of Katori (<i>Xylosoma longifolium</i>) plant were fed to animal having diarrhoea.
		Fruits of Bael (<i>Aegle marmelos</i>) were fed to animals having diarrhoea. (100 g two times a day)
3	Tympany	10 g of Hing (<i>Ferula asafoetida</i>) fed once a day was also reported effective against tympany.
		50 ml of mustard oil (<i>Brassica compertris</i>) drench was reported very effective in cases of tympany.
		Feeding 15-20 leaves of Tulsi (<i>Ocimum sanctum</i>) was also effective in tympanitis.
4	Fracture	Application of Til oil (<i>Sesamum indicum</i>) on the affected part and then fixing it with bamboo splints.
5	FMD	The 100 ml mustard oil (<i>Brassica compestris</i>) after mixing with Haldi powder (<i>Curcuma longa</i>) (2 spoons) and kerosene oil (10 ml) was applied externally on the foot and mouth lesions in case of animals suffering from FMD.
		The bark of the Deodar tree (<i>Cedrus deodara</i>) was soaked overnight in water and the extract was applied over the lesions of the disease. It was done three times a day for 3 days.
		Amla (<i>Embllica officinalis</i>) (100 g) and piece of iron is boiled in one litre of water till it reduced to half. This suspension was then cooled down, and was applied on the affected parts of the animal.
6	Ecto-parasites	Salt added to mustard oil (<i>Brassica compertris</i>) was applied all over the body for control of ecto-parasites.
		Kerosene oil or petrol applied all over the body in case of ecto-parasites.

		About 250 g Shambar leaves (<i>Artemisia nilagirica</i>) were made into paste and fed to animals @ 50 g once for removing internal as well as external parasites.
7	Snake bite	A thick paste of Imli (<i>Tamarindus indica</i>) was prepared with water and applied over the site of snake bite and tied over by a piece of cloth.
		100 g leaves of Tantara (<i>Oroxylum indicum</i>) seeds or its bark were fed to animals in case of snake bite.
		Bulb of onion (<i>Allium cepa</i>) was fed to animals in case of snake bite.
8	Poisoning	200 g Jungli karela (<i>Momordica charantia</i>) was ground and given to animal once a day in case of poisoning.
9	Fever and cold	Massage of warm mustard oil (<i>Brassica compertris</i>) on head and forehead of affected animals helps in cold and fever.
10	Cough	50 g Kali mirch (<i>Piper nigrum</i>), 50 g Badi elaichi (<i>Cardamom</i>) and 50 g ajwain (<i>Trachyspermum ammi</i>) were ground and mixed in small amount of water. The paste was then fed to animal @ half spoon two times a day for 2-3 days.
11	Pneumonia	Alsi or Linseed (<i>Linum usitatissimum</i>) seeds were ground and mixed in wheat flour and fed to animal for a week.

4.5.3.2 Reasons of Mortality of Animals

The study also investigated the reasons for the mortality of the animals according to the perception of the respondents. The results indicated as shown in the Table 4.27 that attacks by predators was the top most ranking reason for the mortality of the animals. The predator animals included Bear, Hyena, and Leopard etc. The erratic and inclement weather and presence of diseases were reported to be second and third topmost ranking reasons for the mortality of the animals. This was followed by mortalities due to accidents at rank four and poisons at rank five respectively.

Table 4.27: Reasons of mortality of animals according to the perception of respondents

Sl.No	Causes	Weight Score	Per cent Weight Score	Rank
1	Diseases	390	65.00	III
2	Predators	528	88.00	I
3	Plant poisoning	208	34.67	V
4	Accidents	257	42.83	IV
5	Inclement weather	520	86.67	II

4.5.4 GENERAL MANAGEMENT

4.5.4.1 Housing

The study reported that all the respondents in the study area kept their animals under open sky round the year. However a small Percentage i.e., 5.00 per cent of respondents reported of having made temporary arrangement for night stay of goat and sheep in winters, where they confined their animals in area bounded by dried out branches of trees.

4.5.4.2 Kid and Lamb rearing in small ruminants

The study reported as shown in the Table 4.28 that the respondents did not provide any special care of the kids and lambs with respect to their feeding and housing. The young ones mainly depended on the milk of their dams. The kids were usually allowed milk feeding up to 6 months of age till they reached the pastures and practically no weaning was practiced.

Table - 4.28: Lamb and kid rearing in small ruminants

Milk feeding continued up to (months)	Any supplements provided	Weaning if practiced, at what age	Grazing started at age
4 to 6	Nil	No weaning	3 weeks

4.5.4.3 Methods of Identification of small ruminants

The results of the study as presented in Table 4.29 reported that the in goat majority i.e., 83.33 per cent of the respondents identified their goats visually and 16.67 per cent used color/paint for the identification of their goats. In case of sheep 60.00 per cent of the respondents identified their sheep by visual method. There were 31.67 per cent of the respondents who identified their sheep by using some color or paint on their body and the other 8.33 per cent identified their sheep based on the presence of small packs of wool on different parts on their body kept after shearing. The marks of color/paint or packs of wool were kept at different positions like top of head, at tail, back, rump etc., by different respondents.

Table - 4.29: Methods of Identification of animals used by respondents**n=120**

Sl. No	Methods	Goat	Sheep
1	Visual method	100 (83.33)	38 (31.67)
2	Using color/paint	20 (16.67)	62 (51.67)
3	Leaving wool packs after shearing	0 (0.00)	20 (16.66)

Figures in parenthesis indicate Percentage

4.5.4.4 Age and Method of castration in small ruminants

Most of the respondents were reported of doing castration in the months of March and September when the temperature was neither low nor high. The results of the study as presented in the Table 4.30 clearly show that the majority i.e., 78.33 per

cent of the respondents was doing castration after the bucks and rams attained an age of 6 to 7 months. This was followed by 15.00 per cent of respondents doing castration at less than 6 months of age while 6.67 per cent of the respondents were reported of doing castration after 7 months of age.

Further majority (58.34%) of the respondents reported castration of their Goat and Sheep by crushing their testicles by sticks or stones and nearly a quarter (23.33%) of respondents were doing castration by using Burdizzo castrator available with the Sheep husbandry department.

Table - 4.30: Age and method of castration adopted in small ruminants

n=120

Sl No	Particulars		Number (%)
A	Age of castration		
1	Less than 6 months		18 (15.00)
2	6 to 7 months		94 (78.33)
3	More than 7 months		8 (6.67)
B	Method of castration		
1	Open method	Knife / Blade	22 (18.33)
2	Closed method	Crushing (Stone /stick)	70 (58.34)
3		Burdizzo castrator	28 (23.33)

4.5.4.5 Vaccination of Small ruminants

The results of the study as presented in the Table 4.31 clearly reveal that a majority i.e., 55.33 per cent of the respondents did not perform vaccinations against any disease. There were only 6.67 per cent of the respondents who were doing vaccinations against all the diseases like ET, PPR, FMD, Sheep pox which were provided free of cost by the State Sheep Husbandry Department. There were 13.33

per cent of the respondents doing vaccination against ET, PPR and Sheep pox and 26.67 per cent of the respondents who were doing vaccination against ET and Sheep pox. The reports of the study indicated that the Bakerwals were very reluctant in vaccinating their Goat and Sheep against various diseases. The Bakerwals reported that the main reason for the very low vaccination was unavailability of Government vaccine supply with the Sheep husbandry department and unavailability of the timely vaccination service. The other reason was a belief of some fraction of Bakerwals that disease occurred due to vaccine itself. For ET vaccination was done twice during a year one in February-March and another in August – September. For PPR vaccination was done, once in kids and lambs at age of more than 3 months and 2nd at 3 years of age. For FMD and Sheep pox vaccination was done once a year and in the month of March- April. These vaccinations were being done by the Govt. sheep husbandry department of the state. There was no availability of the vaccines in the local market.

Table - 4.31: Vaccinations done by the respondents in small ruminants

n=120

SI No	Common vaccinations	Species	Number
1	ET, PPR,FMD, Sheep pox*	Goat and Sheep	8 (6.67)
2	ET, PPR, Sheep pox*	Goat and Sheep	16 (13.33)
3	ET, Sheep pox*	Goat and Sheep	32 (26.67)
4	No vaccination	Goat and Sheep	64 53.33)

(* sheep only)

4.5.4.6 Deworming of Goat and Sheep

The results of the study show that the deworming was done mostly throughout the year and strictly during spring and summer season. From the results presented in the Table4.32 it is clearly evident that in case of Goat and Sheep majority of the respondents performed deworming four times in a year followed by around one

quarter of the respondents who performed three times deworming a year and only small Percentage of the respondents was found doing deworming twice in a year. More intense deworming in sheep was common most probably due to more incidence of endo parasitic infestation in them due to their close and non-selective grazing behavior compared to goats.

Table 4.32: Season of occurrence of common parasitic diseases and the frequency of deworming adopted in small ruminants

n=120

Sl No	Species	Goat	Sheep
A	Season of occurrence	Mainly spring and summer	Mainly spring and summer
B	Frequency of deworming		
1	Twice in a year	24 (20.00)	12 (10.00)
2	Thrice in a year	28 (23.33)	38 (31.67)
3	Four times in a year	68 (56.67)	70 (58.33)

4.5.4.7 Common Ecto-parasitic diseases of small ruminants

The results of the study presented in the Table 4.33 indicate that the common ecto parasitic diseases prevalent in the migratory Goat and Sheep flocks of Bakerwals were Lice, Ticks, Mites; Fleas, Mange (Sarcopties, Psoropties) and Scabies. Pediculosis was common in Goats only. Most commonly the problem of ecto parasites was seen during May to August months.

The treatment of this problem was done by hand method where a cloth or towel was emersed in a bucket containing solution of medicine and then kept over the body affected animal. Only affected animals were treated for the ecto-parasites and not the whole flocks. Many of the respondents were using injectable medicines like Ivermectin for treatment of ecto-parasitic infections.

Table - 4.33: Common ecto-parasitic diseases

Common ecto-parasitic diseases	Pediculosis; Lice, Ticks, Mites; Fleas, Mange (Sarcopties, Psoropties) and Scabies
Season/month of occurrence	May to August
Method of treatment	Hand method and Injectable

4.5.4.8 Season, frequency and method of Clipping in Goat

The results presented in the Table 4.34 indicate that in case of goats clipping was done only once during the year and was done in Feb-Mar before leaving for migration and when the temperature starts increasing in Jammu region. The twin reasons for clipping as reported from the respondents were preventing ecto-parasitic (pediculosis) infestations and protection from the rising temperature. The hairs of the goat were either used for making ropes, mats or rugs or were thrown away.

Table - 4.34: Season, frequency and method of Clipping in Goat

Season/ month	Frequency /year	Method
Spring (Feb - Mar)	Once (100.00)	Hand method

4.5.4.9 Season, frequency and method of shearing in Sheep

The results of the study as presented in the Table 4.35 reported that the seasons of shearing in Sheep were Feb - Mar; June-July and Sept – Oct in case of sheep, the shearing of wool was done thrice in a year by majority i.e., 87.50 per cent of the respondents and only twice by 12.50 per cent of the respondents. The respondents doing two times shearing reported that by this practiced they get a good price for the wool. All the respondents reported that the yield of wool per animal per year was around 1.5 kg for two time or three times shearing. The rate per Kg of wool as reported by the respondents varied from Rs. 60 to Rs. 85. Almost all respondents reported of practicing hand method of shearing while a small Percentage that was practicing machine shearing. Machine shearing facility was provided by Sheep husbandry department in the lower areas where lack of electricity was not a problem.

Table - 4.35: Season, frequency and method of shearing in Sheep

Month	Frequency /year	Respondents Frequency (%)	Production/ Year	Rate/ Kg in Rs	Method
Feb-Mar; June-July; & Sept – Oct	Twice	15 (12.50)	1.25 kg	80 to 85	Hand shear and Machine
	Thrice	105 (87.50)	1.5 kg	60 to 70	

4.6 LIVELIHOOD SECURITY OF BAKERWAL PASTORALISTS

Pastoralist livelihood security index was constructed to assess the livelihood security of the Bakerwal pastoralists of Jammu & Kashmir. The Pastoralist livelihood security index consisted of five broad dimensions of livelihood security which included Natural assets, Social assets, Human assets, Physical assets and Financial assets. It was assumed that the attainment or fulfillment or availability and access to these broad dimensions of livelihood security will completely secure the livelihood of the respondents. Each dimension/domain of the livelihood security further consists of number of indicators which helped in measuring or assessing the Household Livelihood Security (HLSi) due to each dimension and the composite livelihood security (LSi) of individual households. Further the analysis was done to get the standardized indicator scores (Zindj) which are given in the Annexure I, household livelihood security index for each domain of livelihood security (HLSi) and finally composite livelihood security index of each individual household. The results of the above analysis are as under:

4.6.1 HOUSEHOLD LIVELIHOOD SECURITY INDEX VALUES OF DIFFERENT DIMENSIONS OF THE LIVELIHOOD OF BAKERWAL PASTORALISTS.

The value of the HLS index (HLSi) value of each dimension was calculated by averaging the standardized indicator scores (Zindj) in each dimension. Then finally the composite LS index (LSi) of each household was calculated by multiplying

standardized indicator score of each indicator by weighted score of each dimension and taking sum over all the five assets or dimensions. The different dimensions were used in the construction of Pastoralist livelihood security index which included Natural, Social, Human, Physical and Financial assets. Each of the dimensions was assumed to consist number of indicators which had same contribution in the overall livelihood security of the respondents. Further the individual value of each asset or dimension is shown in the Table 4.38 which clearly indicates that respondents were feeling most secure in the natural assets followed by human, financial and physical assets. Further the results also shows that the respondents were feeling least secure or most insure in the social assets.

Table - 4.36: Household livelihood security Index value of each dimension and composite LSI of Bakerwal pastoralsits

Dimensions/assets	HLSi
Natural assets	0.5718
Social assets	0.2802
Human assets	0.4281
Physical assets	0.2969
Financial assets	0.4000
Composite LSI	0.4021

4.6.2 COMPOSITE LIVELIHOOD SECURITY

The results of the study related to household livelihood security indices and composite livelihood security index is shown in Table 4.36. Based on the different indicators the overall value of livelihood security or Composite PLSI value was found to be 0.4414 which indicated that the respondents were only 0.4021 Per cent secure in their livelihood. Though they were relatively more secure in natural, human and

financial assets with Household livelihood security index values of 0.5718, 0.4281 and 0.4000 respectively but they were found to be more insecure in physical (0.2969) and social assets (0.2802) with least household livelihood security index values.

4.6.3 RESPONDENTS PERCEPTION OF PASTORALISTS LIVELIHOOD SECURITY

4.6.3.1 Distribution of respondents according to composite Household Livelihood Security index

The composite livelihood security includes the livelihood security due to all the dimensions taken together. The results presented in the Table 4.37 clearly highlighted that a small Percentage i.e. 20.00 of the respondents was in the high level of livelihood security. The high Percentage i.e., 44.17 per cent of the respondents had a low level of livelihood security followed by 35.83 per cent of the respondents who expressed medium level of livelihood security among the Bakerwal pastoralists. Thus we can interpret that a huge majority of the respondents perceived that their livelihood security was either low or intermediate.

Table 4.37: Distribution of respondents according to overall Household Livelihood Security

Sl.No	Household livelihood security	Frequency (%)
1	Low (< 0.5852)	53 (44.17)
2	Medium (0.5852 to 0.6647)	43 (35.83)
3	High (>0.6647)	24 (20.00)

4.6.3.2 Distribution of respondents according to different Indicators of Livelihood Security

The results of the study as shown in the Table 4.38 present the distribution of the respondents according to their perceived level of security with respect to different dimensions of the livelihood security viz., Natural, Social, Human, Physical and

Financial assets of the respondents. The categorization was done based on the cumulative root mean square frequency method.

A. Natural assets

It is clear from the Table 4.38 that 40.00 per cent of the respondents were in the high level of security with respect to natural assets. There were 40.83 per cent of the respondents in the middle and 19.17 of the respondents in the low level of security with respect to the natural assets.

B. Social assets

The results of the social assets presented in the Table 4.38 show that the majority of the respondents i.e., 65.00 per cent had low security with respect to social assets and 19.17 per cent had expressed medium level of security with respect to the social assets. Whereas there were only 15.85 per cent of the respondents who had high level of security with respect to social assets.

C. Human assets

The results presented in the Table 4.38 indicate that the majority i.e., 55.83 per cent of the respondents expressed medium level of security with respect to the human assets and 25.00 per cent of the respondents fall high level of security with respect to the human assets. Further there were 19.17 per cent of the respondents who belonged to the low level of the security with respect to the human assets.

D. Physical assets

The results presented in the Table 4.38 show that the majority of respondents were feeling insecure with respect to the physical assets. The results clearly indicate that the majority i.e., 60.00 per cent of the respondents expressed low security with respect to the physical assets.

There were 28.33 per cent of the respondents who expressed medium level and 11.67 per cent of the respondents who expressed low high level of security with respect to the physical assets.

Table - 4.38: Distribution of respondents according to different Indicators of Livelihood Security

n=120

Sl.No	Dimension of Livelihood Security	Frequency	Percentage
1	Natural assets		
	Low (< 0.5852)	23	19.17
	Medium (0.5852 to 0.6647)	49	40.83
	High (> 0.6647)	48	40.00
2	Social assets		
	Low (< 0.5852)	78	65.00
	Medium (0.5852 to 0.6647)	23	19.17
	High (> 0.6647)	19	15.83
3	Human assets		
	Low (< 0.5852)	23	19.17
	Medium (0.5852 to 0.6647)	67	55.83
	High (> 0.6647)	30	25.00
4	Physical assets		
	Low (< 0.5852)	72	60.00
	Medium (0.5852 to 0.6647)	34	28.33
	High (> 0.6647)	14	11.67
5	Financial assets		
	Low (< 0.5852)	63	52.50
	Medium (0.5852 to 0.6647)	34	28.33
	High (> 0.6647)	23	19.17

E. Financial assets

The results of the study presented in Table 4.38 highlighted that majority i.e., 52.50 per cent of the respondents expressed low financial security. This was followed by 28.33 per cent of the respondents having medium level of financial security. However there were only 19.17 per cent of the respondents who expressed high level of financial security.

4.6.3.3 Vulnerability in the livelihood of Bakerwal pastoralists

The study also investigated the perception of the respondents about the sources and the level of the vulnerability (Insecurity) in their livelihood security due to these sources. A quick glance on Table 4.39 reflects the sources of vulnerability to the livelihood of Bakerwals.

Table - 4.39: Sources and Level of vulnerability in the livelihood of Bakerwals

Sl.No	Sources of Vulnerability/Insecurity	Weight score	Weight score (%)	Rank
1	Poor veterinary health services	374	66.17	III
2	Poor economic and education status	338	56.33	IV
3	Lack of Mandis or organized markets	320	56.17	V
4	Animal diseases causing high morbidity and mortality	397	69.50	II
5	Lack of feeding resources in part of winter	200	33.33	VII
6	Lack of skills in livelihoods other than animal rearing	281	46.83	VI
7	Inclement weather conditions	423	67.00	I

Further the respondents were asked to rank these sources based on their level of insecurity from 1 -7. After analyzing the data we found that the “inclement weather conditions”, “animal diseases cause high morbidity and mortality” and “poor veterinary health services” in pastures and during migration were top most

Dimensions of livelihood security

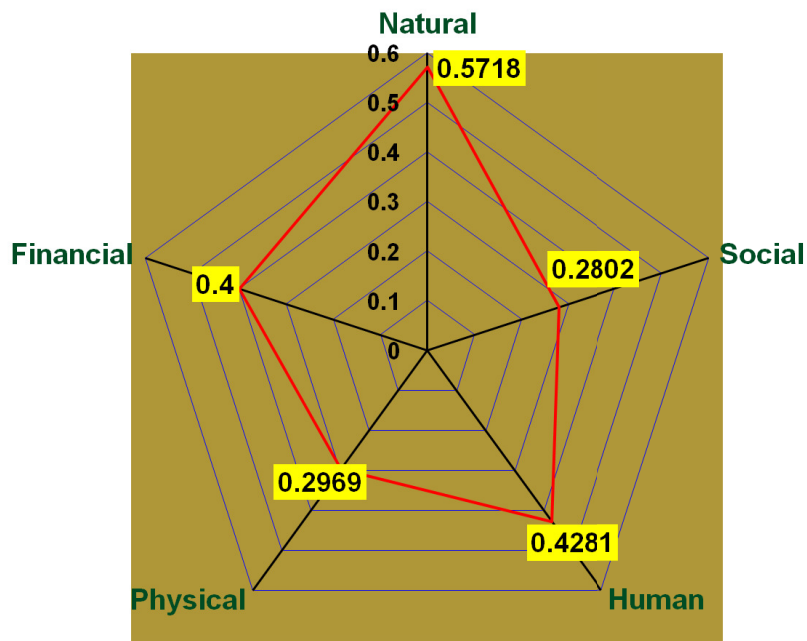


Figure 4.10: Dimensions of Livelihood security

Group Priorities of Different SWOT Groups

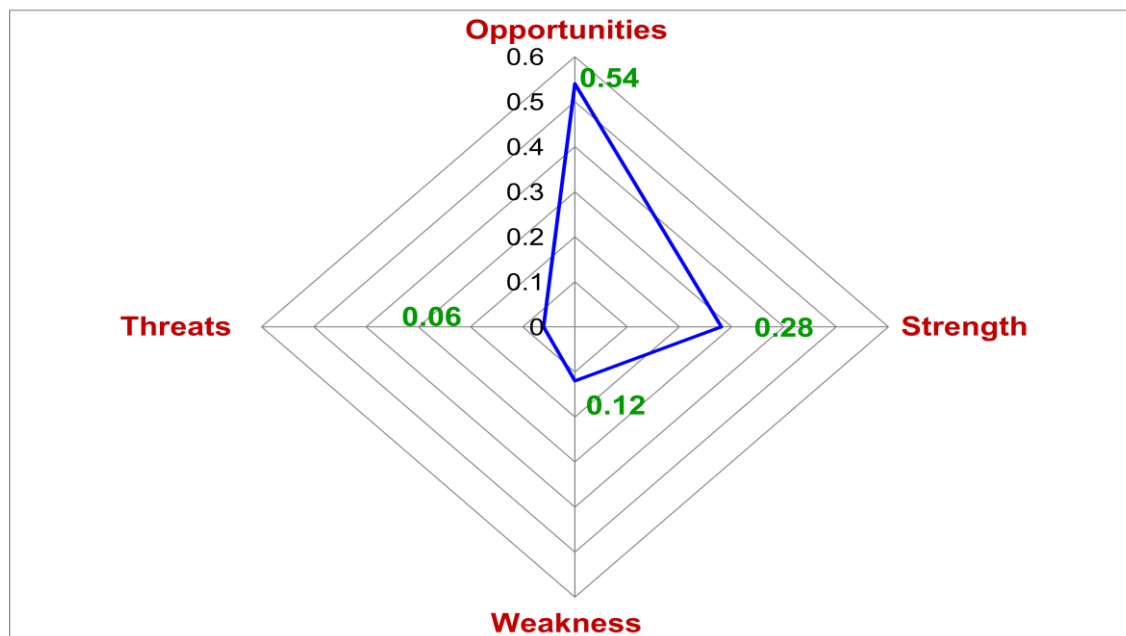


Figure 4.11: Group priorities of different SWOT Groups

vulnerable sources to the livelihood of Bakerwals. Moreover “poor economic and education status” and “lack of Mandis or organized markets” were expressed at number four and five respectively as sources of vulnerability to the livelihood of Bakerwals.

4.6.3.4 Factors needed to secure the livelihood of Bakerwals

The study also ranked the factors as explained by the respondents which were important to secure the livelihood of the Bakerwal pastoralists and are presented in Table 4.40. The study indicated that efficient animal health coverage was the top most ranking factor followed by government support and support from other farming/ agricultural communities; which ranked at second and third positions respectively were considered very essential for securing the livelihood of Bakerwal pastoralists. Further the factors like child education, socio-political capital formation and collective action were another factors needed to improve the livelihood security of Bakerwals.

Table - 4.40: Factors needed for securing the livelihood of Bakerwals

Sl. No	Factors for security of livelihood	Weight score	Weight score (%)	Rank
1	Support from other farming/agricultural communities	470	65.28	III
2	Efficient animal health coverage	600	83.33	I
3	Socio-political capital formation	302	41.94	V
4	Child education	338	46.94	IV
5	Collective action	260	36.11	VI
6	Government support	550	76.39	II

4.7CHALLENGES AND OPPORTUNITIES OF SMALL RUMINANT REARING AMONG BAKERWAL PASTORALISTS

The study used the SWOT analysis in combination with Analytical Hierarchy Process (AHP) to find out the challenges and opportunities in small ruminant rearing among Bakerwal pastoralists. The challenges included the factors or elements in SWOT

group's weaknesses and threats which were actually hampering the success of small ruminant rearing enterprise among Bakerwals. The opportunities included the factors or elements in the SWOT group's strengths and opportunities which were actually or could help in making small ruminant rearing among Bakerwals as a successful, sustainable and more remunerative enterprise. The results of the analysis presented in the Table 4.40 indicated the group priority values (scaling factors) of different SWOT groups where opportunities group gets the highest value (0.5443), followed by strengths group (0.2825) and weaknesses group (0.1171). The threat group had the least group priority value (0.0560). These group priority values indicated that the opportunities were most dominating and followed by strengths. The threats group had very least effect, after weaknesses.

All this above discussion signified that there was good prospectus for small ruminant rearing among the Bakerwal pastoralists if the opportunities were properly tapped and strengths were efficiently utilized besides properly tackling weaknesses and threats. Based on the group priority values the various SWOT factors with their local and global priorities are discussed in detail. The local priorities of SWOT elements in each group indicate their relative position or weightage with respect to each other. While as the global priorities indicated the relative position of a SWOT factors /element among all the SWOT factors /elements in all the four SWOT groups. The global priorities identify the factors which need most attention and also show factors which can be ignored in planning process in small ruminant rearing among Bakerwal pastoralists.

4.7.1 STRENGTHS

A cursory look on Table 4.41 revealed that Strengths group was found to be second highest (0.28) priority group. Among various strength factors huge availability of pastures and rangelands was expressed as the top most strength by the respondents. This was followed by small ruminant rearing being the primary reliable source of sustenance, subsistence and livelihood. The study reported that the respondents did not experience any shortage of grazing resources in major part of the year. The small ruminant rearing enabled them to earn their livelihood as it was

the only major source of income because they were not having any land ownership for cultivation of any crops. Synchronous adjustments and adaptability of pastoralists and their flocks; and low or minimum input rearing of livestock ensured by pastoral mode of life were the other strength factors. Though the pastoralists and their flocks of animals were exposed to various severe pressures and stresses like extreme and unpredictable weathers, lack of shelters and many other facilities; but they have adjusted to this mode of life which is almost impossible for the common masses to think of and live in. The strength factor conservation of indigenous small ruminant genetic resource was given very less importance by the respondents.

Table - 4.41: SWOT analysis of Bakerwal pastoralists

SWOT Groups	Priority of the group (Scaling factor)	SWOT factors	Consistency ratio (CR)	Priority of the factors within SWOT group	Global or overall priority of the factor
Strengths (S)	0.28	S1: Small ruminant rearing is primary reliable source of sustenance, subsistence and livelihood	5.1 %	0.240	0.067
		S2: Synchronous adjustments and adaptability of pastoralists and their flocks		0.199	0.056
		S3: Pastoral mode of life ensures low input rearing of livestock		0.188	0.053
		S4: Huge availability of pasture and rangelands		0.307	0.086
		S5: Conservation of indigenous small ruminant genetic resource		0.066	0.018
		$\lambda_{max} = 5.230441$		CI = 0.05761	
Opportunity (O)	0.54	O1: Scope for establishment of organized markets and processing units	7.8 %	0.387	0.209

		O2: Establishment of state affiliated pastoral organizations/associations		0.225	0.122
		O3: In context and favorable Govt. policies		0.257	0.139
		O4: Biodiversity conservation and sustenance of happy pastures		0.073	0.039
		O5: Necessity of plant and animal scientific interventions		0.058	0.031
		$\lambda_{max} = 5.352078$		CI = 0.088019	
Weakness (W)	0.12	W1: Less remuneration of small ruminant rearing	3.0 %	0.448	0.054
		W2: Illiteracy and skilllessness		0.125	0.015
		W3: Lack of public infrastructure and Govt. services		0.213	0.025
		W4: No land ownership for permanent settlement and agriculture		0.142	0.017
		W5: Societal isolation and socio economic backwardness		0.072	0.009
		$\lambda_{max} = 5.134932$		CI = 0.033733	
Threats (T)	0.06	T1: Changing land use pattern	10 %	0.421	0.025
		T2: Geo-political tensions		0.204	0.012
		T3: Health concerns		0.062	0.004
		T4: Unpredictable climatic pattern		0.198	0.012
		T5: State and central Government apathy		0.115	0.007
		$\lambda_{max} = 5.456383$		CI = 0.114096	

The consistency ratio of the comparison between four SWOT groups was 9.7 percent. When comparing four SWOT groups the values of λ_{max} was 4.263071; CR was 0.097434 and CI was 0.08769.

4.7.2 OPPORTUNITIES

The opportunity group was found to be the topmost priority group having the highest (0.54) group priority value as indicated in Table 4.41. Thus the study shows that according to the perception of the respondents there were tremendous opportunities existing in the way of small ruminant rearing among the Bakerwals. Among various opportunity factors “scope for establishment of organized markets and processing units” was the chief priority factor followed by “in context and favorable Govt. policies”. According to the respondents the existing livestock marketing system existing among Bakerwals was very primitive and exploitative one, which involve small scale sale for subsistence and majority of the sale occurring through various middlemen and agents. There was no processing of any of the animal products and sale involved only live animal sale. Thus organized marketing and links with the processing units was a great opportunity. The government could form favorable plans and policies that could support small ruminant rearing keeping in view that domestic demand of the state for Mutton and Chevon. The other important opportunity at third number was establishment of state affiliated pastoral organizations/associations/Panchayat systems. These Bakerwals associations or organizations could help them to better understand their own community and help in showing their presence in the main society and increasing their say and position in the livestock business. The other factors like biodiversity conservation and sustenance of happy pastures; and necessity of plant and animal scientific interventions were given relatively less importance by the Bakerwal pastoralists.

4.7.3 WEAKNESSES

The weaknesses group came at the number three (0.12). Table 4.41 revealed that among various weakness factors “less remuneration of small ruminant rearing” was indicated at the top level. During the data collection the respondents expressed that the small ruminant rearing was less profitable due to huge mortality of the animals due to predators, unpredictable and inclement weather conditions and diseases. After fighting nature the mortality due to diseases, break the back bone of livestock

wealth of Bakerwal pastoralists. Next in the weakness factors comes “lack of public infrastructure and Govt. services”, which were lacking in remote and far-flung areas inhabited by Bakerwals. They reported of lacking even the basic health and education services and at many places have to arrange human food resources in advance. The weakness factors like “no land ownership for permanent settlement and agriculture” and “Illiteracy and skill-lessness” were reported at third and fourth number in this group. The respondents expressed that these factors together hampered or prevented them from any settlement decision and taking any alternative business or job opportunity. The factor expressed as least weakness by the respondents was societal isolation and socio economic backwardness, which further deprived them of benefits of living in the main exposed societies full of many jobs and opportunities.

4.7.4 THREATS

The least expressed priority group was threats group (0.06) in the Table 4.41 it was revealed that the most important factor considered in this group was changing land use pattern which was given highest priority. The respondents expressed that now a days they were facing severe problems of encroachment of grazing lands, closure of forests and migration routes, nomination of grazing lands and pastures as Wild life reserves and National parks , construction of roads and railway tracks through the migration routes and grazing areas; which are severely effecting their livestock rearing and migration movements.

The other less expressed threats were geo-political tensions and unpredictable climatic patterns which come at second and third positions respectively in the threat group. The small ruminant rearing activity of Bakerwals was also seriously affected by armed conflict at the international borders with Pakistan and occupation of many big pastures by the army and BSF which these Bakerwals were prevented from entering or moving nearby also. The Bakerwals also report of being faced with erratic and inclement weather patterns in the area over the last ten fifteen years, which was also making timely migration cycle difficult.

The least threats expressed were state and central Government apathy and health concerns (Zoonosis, Anthroozoonosis and emerging and Re-emerging diseases). The respondents expressed that if the stance or same attitude of the Govt. continued towards Bakerwal community, then it will die a natural death. Further they were least concerned with the health concerns related with the livestock rearing. Most probable reason for this could be their lack of knowledge about the zoonotic health effects and concept of emerging and re-emerging diseases.



Plate No. 7 After data collection from Bakerwal families





Plate No. 8 Interaction and data collection from the respondents





Plate No. 9 After group discussion with the SHD people & Bakerwals



CHAPTER –5

Summary and Conclusion

5. SUMMARY AND CONCLUSION

5.1 SUMMARY

India is home to a large number of pastoral groups who are rearing different species of livestock like Cattle, Buffalo, Goat, Sheep and Camel and are present different agro climatic conditions with varied types of climates like temperate, tropical and dry types of climate. There are more than 200 tribes comprising six per cent of the country's population engaged in pastoralism. (Sharma *et al.*, 2003). Livestock provides local people in isolated areas with milk, meat and wool. Pastoralists use marginal, otherwise uncultivable land, increasing the amount of land available to an already expanding population. They also rear indigenous animal breeds, retaining rich genetic variety. In spite of being in such a large number, these pastoral communities have very low public and political profile. Scientists also point fingers at them for adhering to an obsolete form of production, despite their large contribution to the national economy in terms of production of milk, meat, wool, leather etc.

Bakarwals, one of the tribal communities of Jammu & Kashmir forming largest small ruminant rearing pastoralist groups in Himalayan region of J&K. They practice nomadic and semi nomadic transhumant type of pastoralism which is under intense transformations in recent decades due to socio-political and land use changes. Climate change is also affecting their livestock and seasonal migration cycle. They are deriving their livelihood from the presumably unproductive lands which are not fit to be used for agricultural purposes. They are socially, economically and politically marginalized group of people who are mostly living below poverty line and have very little access to the various social, educational and health services provided by the state government. Despite the fact that nomadic herders are amongst the most food insecure groups in the area, pastoral systems have received little or no attention from researchers and extension services.

With the above conditions of Bakerwals pastoralists in mind a study was planned to be carried out in Jammu & Kashmir state to pinpoint the key issues of socio-cultural importance and to ascertain the livelihood security and future prospects of the small ruminant rearing among the Bakerwals pastoralists. The existing Goat and Sheep rearing practices of Bakerwals were also studied to get an insight into various shortcomings and gaps in management practices and to suggest suitable remedies. The present study entitled “**Small Ruminant Rearing among Bakarwal Pastoralists of Jammu & Kashmir - An Exploratory Study**”, was designed with the following objectives:

1. To explore the socio-cultural and migratory aspects of Bakarwal pastoralists of Jammu & Kashmir
2. To study the management practices followed by the respondents in small ruminant rearing.
3. To measure the livelihood security of Bakarwal pastoralists through small ruminant rearing.
4. To find out the challenges and opportunities in small ruminant rearing among Bakarwal pastoralists.

5.1.1 RESEARCH METHODOLOGY

Jammu & Kashmir state was selected purposively for the study. The Bakarwals in the study area were following six major well established routes for migration of their livestock from winter locations in Jammu to summer pastures in Kashmir and these routes were selected for the present study. From each selected routes 20 Bakerwals were selected randomly as respondents. Finally 120 Bakarwal pastoralists were interviewed to get the first hand information on small ruminant rearing. The Pastoralist Livelihood Security Index was developed to measure livelihood security of Bakerwals. For SWOT analysis Focused Group Discussions were made involving participants from Bakerwals and experts from State Sheep Husbandry Departments, which were selected purposively for the study. This includes Bakerwals having broad overview of their Bakarwal community and of small ruminant rearing among them.

Data was collected using structured and semi structured interview schedules and appropriate PRA tools. The data collected was compiled, tabulated and analyzed using appropriate statistical tools which included descriptive statistics (simple frequency, arithmetic mean, geometric mean, standard deviation etc.), cumulative root mean square frequency method and matrix analysis methods to draw the meaningful conclusions.

5.1.2 SALIENT FINDINGS

The study reported that majority (54.17%) of the respondents belonged to middle age group (36-50 years) and a great majority of the respondents (87.50 %) were found illiterate. The family size of majority (57.50%) of respondents was small (<8), and majority (52.50 %) of the respondents had a low social participation.

It was found that majority (70.00 %) of the respondents were landless with no source of income other than small ruminant rearing. It was also found that a large percentage (47.50 %) of the respondents had a small flock size of less than 185 Goat and Sheep and majority (67.50 %) of the respondents belonged to low income group having annual income of less than Rs. 87249.21 with the major share (81.09 %) of the annual income coming from the sale of live animals.

The respondents belonged to Lehiwal, Khatana and Badana clans. All the Bakerwals celebrated all common muslim festivals like Nauroz, Shabi Qadr, Eid-ul-Fitr, Eid-ul-Azha, Eid Meelad-un-Nabi, Moharam etc. besides these they also celebrated Satimi and Besakhi. Majority of the respondents were also found having strong beliefs in Peers, Taviz and Nazar etc.

The livestock holding of the Bakerwals consisted of Goat, Sheep, Cattle, Horses and Dogs but it was dominated by Sheep (57.40%) followed by Goat (37.39 %). In flock structure there were about 39 per cent of adult breeding females (Does/Ewes); followed by 24 per cent kids and lambs (age up to 1 month).

It was observed that in composite flocks only 57.87 per cent of Goat and Sheep were owned by respondents and rest animals in the flock were either shared (36.75 %) or taken from others on contract (5.83 %) for pasturing.

In the marketing pattern it was found that among different categories in the structure of the flock mainly castrates (15.25 %) were targeted for sale followed by young males (12.81%). Breeding male animals were least sold (only 2.64%). Six marketing channels were identified for sale of live animals and majority of the sale occurred through Middleman (55 %) and Kothdars (10 %). For marketing of wool 2 channels were there where 85 per cent of respondent's sale was through village traders to whole sellers. No marketing of milk or milk products was reported among the respondents.

The Bakerwals followed six major routes for their cyclic migration between summer and winter pastures, taking them 40 to 65 days to reach their final destination. The number of halts and the number of days stayed at each halt varied based on the various factors like availability of feeds for the animals and the real time weather conditions. Majority of the families moved in groups of four and five.

For majority mobility was transhumant type and followed were following full family migration. The top most problems reported by the respondents during migration were lack of shelter for the animals and humans which was endangering the life of their animals and themselves also and other problem was occurrence of disease during migration.

The important source of the feed for the animals during all the phases of migration was communal grazing and browsing. There was shortage of feed only during extreme winter in Jammu (December to January) when the Bakerwals had to provide mainly lopping to their goats and to manage some feeds like conserved feeds and crop residues for their goat and sheep. The concentrate was fed by one quarter of respondents to the animals only during winters. Salt feeding was repeated after every week and two weeks at the rate of 50 g per animal in summer and winter respectively.

Majority of the respondents were following single species grazing during migration and mixed species grazing in summer and winter pastures. The grazing hours varied in different phases of migration. It was 7 hours during migration, 11 hours in summer pastures and 8 hours during winters.

The respondents did not expressed shortage of water in any phase of migration. However, they have to travel relatively more distance in winters to reach the water sources. Springs, ponds and streams were the chief sources of water for them. Besides this some also used rivers/rivulets as water sources in winters. In summers majority of respondents were following two times watering compared to one times watering, while in winters all the respondents were following only one times watering for their goats and sheep.

The three quarters of the respondents were selecting their breeding males on the general appearance only. It includes features like general health, strong legs, and close grazing behavior in case of Rams and good browsing ability in case of Bucks. The intense breeding period was August - September and the intense kidding/lambing season was January - February. The average age at first kidding in goat was 21.80 ± 3.27 months and at first lambing in sheep was 20.16 ± 3.06 months.

The average age at first kidding/lambing in case of goat and sheep was found in the range of 15-30 months and 15-24 months, respectively. Kidding and lambing rate was found to be 62.10 per cent 59.69 per cent in goat and sheep respectively. The kidding/lambing interval in both goat and sheep was one year and the mortality rate in kids was 19.21 per cent and that of lambs was 16.14 per cent. Twinning rate in goat was 3.57 per cent and was only 1.69 per cent in case of sheep.

The majority of the respondents were treating their animals using ethno-veterinary practices by using the locally available resource.

In general management the respondents were always keeping their animals under open sky. No special feeding care of kids and lambs was practiced who were usually not weaned at all.

Majority of the respondents (83.33%) were identifying their goats visually but in case of sheep majority were using color/point marks for identification purposes.

Majority of the respondents (78.33%) were found castrating their goat and sheep at the age of 6 – 7 months by crushing their testicles using stones or sticks.

Majority of the respondents (53.33%) were not doing any vaccinations but a majority (56.57%) of the respondents were doing deworming in their animals four times a year.

Clipping in goat was done only once but shearing in sheep was done by majority (87.50%) of the respondents thrice in a year and the rest were doing it only twice in a year. Average yield of wool per sheep per year was in the range of 1 – 1.5 kg.

The livelihood security of the respondents was very poor with the composite livelihood security index value of 0.4021 only, which means that their livelihood was secure to level of 40.21 per cent only. Further only 20.00 per cent of the respondents were found in the high level of livelihood security. They were found to be most insecure in social and physical assets and relatively secure in natural, human and financial assets.

In combined SWOT- AHP procedure it was found that the opportunities and strengths were dominating over weaknesses and threats, implying a positive future prospectus for the small ruminant rearing among Bakerwal pastoralists. The top most opportunities were “scope for establishment of organized markets and processing units” and “in context and favorable government policies” and “establishment of state affiliated pastoral organizations/associations”. The important challenges were less remuneration of small ruminant rearing and changing land use pattern.

5.2 CONCLUSIONS

The present study about small ruminant rearing among Bakerwal pastoralists of Jammu & Kashmir was an exploratory type of study, which was intended to explore the various basic information about the transhumant pastoral system of Bakerwals, about which very little was known before this study due to the lack of research in this area. This study explored the socio cultural and especially migratory aspects of Bakerwal pastoralists of Jammu & Kashmir. The study also reported the existing small ruminant rearing practices followed by Bakerwals. Besides this, the study also explored the livelihood security of the Bakerwals through small ruminant rearing. The study also identified various opportunities and challenges of transhumant pastoral system of Bakerwals.

- Bakerwals were of low socio-economic profile with majority (70.00%) being landless and with low social participation. The primary occupation of all the respondents was small ruminant rearing and contributing more than 90 per cent of annual income either through sale of live animals or wool or through hiring charges for pasturing goat and sheep of others fellow Bakerwals or non Bakerwals.
- Their marketing pattern of live animal sale and wool was traditional and exploitative in nature due to involvement of middleman and Kothdar in its marketing. Very less percentage of respondents sold their animals directly to the end user.
- Bakerwals were faced with multitude of problems during migration and the important ones were lack of shelter for the animals and humans, occurrence of disease during migration coupled with inadequate veterinary facility and restriction of entry of animals in particular villages or forests areas.
- Communal grazing/browsing was the main source of feed for the animals. The respondents faced scarcity of feed only during extreme winter months of (December January). No shortage of water was expressed by respondents

although many respondents complained of having to travel relatively large distance for watering their animals.

- Majority of the respondents (75.00%) were selecting breeding males based on general appearance only and castration was done at the age of 6 - 7 months of age and so majority of the Bakerwals were not practising controlled breeding by separating breeding males from the females during most part of the year.
- Intense breeding season was reported to be in Aug-Sept months and the intense kidding/lambing was reported in Jan-Feb months. The range of age at first kidding/lambing in goat and sheep was 15-30 months and 15-24 months respectively.
- Health care management was a major concern reported by majority of the respondents. Major morbidities in goat and sheep were due to parasites, PPR and ET diseases. In goat there was also morbidity due to CCPP and in sheep there were also huge morbidities due to foot rot, pneumonia and poisoning. The main mortalities in both goat and sheep were due to ET and PPR diseases. Main reasons for mortality of adult animals were reported to be predators in the summer pastures and forest areas, inclement weather conditions and occurrences of diseases.
- In general management no special care of feeding of young ones, advance pregnant and lactating dams was practised. Majority of the respondents (53.33%) were not performing vaccination of their animals.
- The large percentage of the respondents was in low (44.17 %) and middle (35.83 %) level of livelihood security. Majority of the respondents were most insecure in social and physical assets.
- The study concluded huge scope for small ruminant rearing among Bakerwal pastoralists of Jammu & Kashmir. The chief opportunities were scope for establishment of organized markets and processing units and in context and favourable government policies.

5.3 IMPLICATIONS AND RECOMMENDATIONS

- Bakerwals depend totally on communal grazing lands for major part of the year, so the health of the pastures and flora on the route of migration needs to be protected and promoted for ensuring the sustainability of the system.
- The goat and sheep management practices of Bakerwals with respect to feeding, breeding, health care and general management need to be upgraded by educating them through various awareness and need based training programmes.
- Organized marketing system needs to be developed to reduce the number of intermediaries so as to make small ruminant rearing a remunerative enterprise for Bakerwals.
- Delineation of some important migration routes for Bakerwals should be done by the government and the rights of Bakerwals over these routes should also be protected as to enable them to move freely over these routes.
- Livelihood security of the Bakerwal pastoralists needs to be ensured and alleviated. Skill development programmes should be initiated so as to promote income diversification among Bakerwals.
- The physical and social assets need to be developed. This could be done by promoting formation of some self-help groups or common interest groups among the Bakerwals and linking of these groups with the main marketing agencies or groups. More mobile schools need to be formed and run properly. Health services for humans and animals need to be ensured during all phases of migration. Some permanent sheltering arrangements along the migration routes need to be developed.
- Special policy interventions on part of the Government are need of the hour. These include reservation of certain important routes of migration for Bakerwals. Government should formulate some skill enhancement programmes for income diversification. Human and animal health service coverage should be improved. The government should formulate some special programmes on Public Private Pastoralist Partnerships so as to

strengthen the social networks and wellbeing of Bakerwals. The government should also enforce through legislature to protect the rights of Bakerwals. (Life insurance for humans and animals)

- Establishment of state affiliated pastoral organisations should be done. This could help in better understanding the problems of Bakerwals at grass root level. It will also help the capacity building agencies and change agents to target these mobile pastoralists easily. Further it will also help in increasing the representation of Bakerwals in policy making by the administration.
- Collective action by Bakerwals for natural resource management. It includes joint investment in buying, constructing and maintaining local infrastructure and technologies, setting and implementing rules to exploit a resource, represent group to the outside and sharing information.

5.5 SUGGESTIONS FOR FUTURE RESEARCH

1. A comparative study on goat and sheep husbandry practices among Bakerwals pastoralists and other goat and sheep rearing communities (Gujjars, Chopans, local breeders) of Jammu & Kashmir.
2. A study on productive and reproductive performance of goat and sheep among the Bakerwal pastoralists of Jammu & Kashmir.
3. Assessment of the training needs of the Bakerwals on scientific goat and sheep husbandry practices.
4. A study on factors influencing the adoption of scientific goat and sheep rearing practices among Bakerwal pastoralists.
5. An exhaustive study on the constraints influencing productivity and goat and sheep management among Bakerwals.
6. A study on documenting and validating traditional/indigenous knowledge systems of pastoralists in goat and sheep husbandry among Bakerwal pastoralists of Jammu & Kashmir.
7. An exhaustive study on the constraints faced by the Bakerwals during different phases of migration.

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Appendices

Interview Schedule
Socio-cultural and Migratory Aspects of Bakarwal Pastoralists of Jammu & Kashmir

Sr. No. _____ Date: _____
 Village _____ Route _____
 Name of Respondent _____
 Fathers Name _____

Socio Personal Variables

1) Age _____ Years

2) Education:

- a. Illiterate (0)
- b. Functionally literate (1)
- c. Primary (2)
- d. Middle (3)
- e. Secondary (4)
- f. Senior Secondary (5)
- g. Graduate and Above (6)

3) Land holding:

Sl. No	Land holding (in acres)	
1	Landless (nil)	
2	Marginal (<2.5)	
3	Small (2.6-5)	
4	Medium (5.1-10)	
5	Large (>10)	

4) Occupation

Sl. No.	Occupation	Main (2)	Subsidiary (1)
1	Small ruminant rearing		
2	Agriculture & Dairy		
3	Labor		
4	Artisan		
5	Business		
6	Any other		

5) Annual income

Sl No	Source of income	Rupees per annum
a	Sheep and Goat Rearing	
b	Dairying	
c	Labor	
d	Business	
e	Any other	

6) Social participation

Sl No	Category	Score
a	No membership	0
b	Membership in one organisation	1
c	Membership in more than one organisation	2
d	As an office – bearer	3

7) Sources of information

Sl. No	Information Sources
1	Institutional Sources
a	Village Panchayat personal
b	Extension personal
c	Veterinary Surgeon
d	NGO's
2	Non Institutional Sources
a	Village key personal
b	Other LS owners in village
c	Traditional healers/vaidya(s)
d	Relatives
3	Mass media sources
a	Radio
b	Television
c	News Paper
d	Veterinary awareness camps
e	Farm Publication
f	Poster

8) Culture (folk beliefs, festivals)

9) Compositions, Structures and Ownership of Household Livestock

Sl. No.	Structure	Number	Ownership		
			Own	Shared	Taking others
1	Goat				
a	Kids <6 months				
b	Males 6-12 months				
c	Females 6-12 months				
d	Does				
e	Bucks				
f	Castrates				
2	Sheep				
a	Lambs <6 months				
B	Males 6-12 months				
C	Females 6-12 months				
D	Ewes				
E	Rams (intact)				
F	Castrates				
3	Cattle				
A	Cows				
B	Bulls				
4	Equine				
A	Horses				
B	Mules				

10) Marketing pattern

a) Milk production and disposal(in a day)

Livestock	Average production				Average Consumption				Average Sale				Price per unit (Rs)	To whom sold
	Home	Migration	Pasture	Unit	Home	Migration	Pasture	Unit	Home	Migration	Pasture	Unit		
Goat milk														
Sheep milk														
Cow milk														
Buffalo														
Ghee														
Others														

b) Marketing pattern of Small ruminants

Sl. No.	Classes of Animals	Sold			
		Number	When/ Months	Unit Price	Total price
	Goat				
1	Doe				
2	Buck				
3	Male kid				
4	Female kid				
5	Castrate/fatten				
	Sheep				
1	Ewe				
2	Ram				
3	Male lamb				
4	Female lamb				
5	Castrate				
6	Others				

c) Marketing channels

Channels adopted in marketing of Milk and milk products

Producer					consumers
----------	--	--	--	--	-----------

Channels adopted in marketing of animals (sheep and goat)

Producer					consumers
----------	--	--	--	--	-----------

Marketing of wool

Producer					consumers
----------	--	--	--	--	-----------

d) Reasons for sale of livestock

Sl. no.	Reasons for sale of animals	Rank
1	Too heavy	
2	Very old	
3	Lambing and kidding problems	
4	Too many males/females	
5	Unwanted physical features	
6	Health condition	
7	Any other	

11) Migration aspects of Bakerwal pastoralists

a) Distance, Duration, Timing, number of halts and Route of Migration followed by Bakerwals

Sl. No.	Distance (Kms.)	Duration (Days)	Season/ Months of migration	Number of halts throughout migration	Average No. of days at each transit	Route
1						
2						

b) Number of families moving together and livestock mobility

Sl. No.	Characteristic
1	Number of families
a	One
b	Two
c	Three
d	Four
e	Five or more
2	Livestock mobility
a	Nomadic
b	Transhumance
c	Sedentary

c) Migration of family with flock

Sl. No.	Characteristics
a	Full family migration
b	Only male members move
c	Young families move with children but old members stay at home

d) Reasons for Migration of Goat and Sheep

Sl. No.	Reasons for Migration	Rank
a	Search of feeding resources	
b	Income from animal hiring	
c	Traditional practice	
d	Extreme whether/temperature variations	
e	Better marketing	

e) Problems During Migration

Sl. No.	Problem	Rank
a	Occurrence of disease during migration	
b	Lack of veterinary facility	
c	Lack of shelter for the animals and humans	
d	Predators problem	
e	Abortions due to stress	
f	Theft of animals	
g	Carrying sheep fallen sick during migration	
h	Restriction of entry of animals in particular village	

f) Sources of veterinary treatment across migration

Sl. No.		
a	Quacks/Salesmen/ medical store	
b	Fellow farmers	
c	Mobile veterinary clinics	
d	Self- prescription	

Management Practices followed by Bakarwal Pastoralists of Jammu and Kashmir for Goat and Sheep Rearing

1) Feed and water resources and feeding managements

a) Sources of feed, type of grazing land and grazing system of goats and sheep

Grazing systems	
Source of feed	
Range	
Stubble	
Type of grazing land	
Open grass land	
Tree covered	
Bush/Shrub	
Stone covered	
Grazing	
Single species	
Mixed species	

b) Grazing out time

Sl. No.	Season	Timing
1	Summer	From:AM ToPM
2	Monsoon	From:AM ToPM
3	Winter	From:AM ToPM

c) What other types of feed and supplements you provide your animals

Sl. No.	Feed Types	Sheep				Goat			
		Lambs	Ewe(Lactating)	Ram	Castrates	Kids	Does	Buck	Castrate
1									
2									
3									
4									
5									
6									
7									
8									

d) If there is feed shortage in some part of year in your locality, why? (Rank)

Sl. No.	Reasons	Rank
1	Shrinking of grazing lands	
2	Decline in productivity of grazing lands	
3	Over grazing	
4	Protection on grazing lands	
5	Geo political tensions	
6	Others, specify	

e) Source of water, distance to the nearest source and frequency of watering of animals

Source of water

Sl. No.	Sources of water	Winter season	Summer season	During Migration
1	River			
2	Spring			
3	Pond			
4	Pipe			
5	Rain			
6	Well			
7	Any other sources			

Distance and frequency

Sl. No.	Distance travelled	Frequency of watering animals
	i. < 1 Km	i. Once per day
	ii. 1-3 Km	ii. Twice per day
	iii. 3- 5 Km	iii. Thrice per day
	iv. 5 to 8	

2) Breeding and reproductive performance

		Goat	Sheep
1	Age of breeding		
a	Male		
b	Female		
2	Criteria for selection of male		
a	General appearance		
b	Pedigree		
c	Progeny characteristics		
3	Season for intense		
a	Breeding		

b	Lambing/kidding		
c	Spread throughout the year		
4	Number of births		
a	Number of lambs/kids		
b	Number of twinning's		
c	Lambing/kidding/interval		
d	Mortality rate in kids/lambs		

3) Health care and Management

a) Treatment

S. No.	Species	Characteristics			
		Common diseases	Occurrence in season /month last year	Mortality last year	Treatment by agency
1	Goat	PPR			
		CCPP			
		Enterotoxaemia			
		Foot and mouth			
		Pox			
		Parasitic diseases			
		Posining			
2	Sheep	PPR			
	a	Pneumonia			
	b	Enterotoxaemia			
	c	Foot and mouth			
	d	Pox			
	e	Foot rot			
	f	Parasitic diseases			
	g	Poisoning			

b) Vaccination

Species	Characteristics			
	Common vaccinations	Season or month performed	Frequency (Yearly, 6monthly or anytime)	Agency
Goat	PPR			
	Enterotoxaemia			
	Foot and mouth			
	Pox			
Sheep	PPR			
	Enterotoxaemia			
	Sheep-pox			
	Foot and Mouth			
	Pox			

c) Deworming

Species	Common parasitic diseases	Characteristics			
		Season of occurrence	Season of deworming	Frequency of deworming (Yearly, 6 monthly or anytime)	Agency
Goat					
Sheep					

d) Dusting or Dipping

Species	Characteristics				
	Common ecto parasites	Season of occurrence	Season of treatment	Frequency treatment (Yearly, six monthly or anytime)	Agency
Goat					
Sheep					



e) ITK' Used for treatment of various disease conditions

Species	Disease condition	Indigenous treatment used ITK's and its mode of application (quantity, method and duration)
Goat		
Sheep		

4) General Management

a) Housing

Sl.no	Species			
1	Goat	Open	Temporary tent house	Others
2	Sheep	Open	Temporary tent house	Others

b) Lamb and kid rearing

Sl.no	Species	Milk feeding continued for (months)	Any supplements provided	Weaning if practised, at what age	Grazing started at age
1	Goat				
2	Sheep				

c) Identification methods

Sl.no	Species	Visual method	Color/paint	Tagging/branding	Any other
1	Goat				
2	Sheep				

d) Castration

Sl.no	Species	Age	Method	Instrument used	Reason
1	Goat				
2	Sheep				

e) Fattening

Sl.no	Species	Practised or not	Method
1	Goat		
2	Sheep		

f) Disposal

Sl.no	Species	Sale of live animals		Mortality		Animals given as Gifts	Animals Slaughtered
		Adults	Kids	Adults	Kids		
1	Goat						
2	Sheep						

g) Reasons of mortality

Sl.no	Reasons	Rank
1	Diseases	
2	Predators	
3	Accidents	
4	Poisons	
5	Rains/cloud bursting/snows etc.	

h) Shearing and clipping

Sl.no	Species	Characteristics				
		Season or month	Frequency in year	Production per animal per year	Rate per KG	Place of sale of wool
1	Goat					
2	Sheep					

Index for Assessing Livelihood Security of Bakerwal pastoralists

S. No.	Statements	SA	A	DA
Natural assets				
1	Pastures are well available and accessible to you for grazing of animals			
2	Your recognized pastures are sufficient in quantity and quality for grazing of your animals			
3	Condition of pastures is deteriorating over period of time (poisonous plants)			
4	Over grazing and browsing is affecting land and vegetation			
5	There are sufficient water sources/points along the route of migration			
6	Productive & reproductive performance of existing sheep and goat breeds is satisfactory			
7	Weather and climatic conditions are conducive for rearing of sheep and goat			
8	Natural disasters/ calamities affect the flock size			
	Others (Please Specify)			
Social assets				
1	Bakerwal community strong intra social relationship			
2	Social groups like CIG's, SHG's etc are existing in your community			
3	Bakerwal are well adjusted with the culture of other pastoral and semi-pastoral communities in the area (agro-pastoral)			
4	Pastoralists suffer loss due to stealing of animals during migration			
5	Bakerwal have a direct linkage with various market development agencies			
	There are adequate social institutions for interaction/participation			
6	Pastoralists have good social networks to update the latest technical knowhow			
7	Rules and regulations of the forest department are unfavourable for grazing of animals			
	Others (Please Specify)			
Human assets				
1	Pastoralists have adequate planning and decisions making abilities for successful livestock business			
2	Pastoralists have relevant indigenous traditional knowledge in tracking environmental conditions			
3	You well versed with the identification of various forest plants of economic importance			
4	Bakerwal pastoralist have good expertise in breeding, health care and marketing activities of livestock			
5	You have good knowledge of symptoms and indigenous management of various disease conditions			
6	Pastoralists have skills for pursuing livestock rearing in adverse			

	conditions			
7	Family member are competent enough to perform other job than animal rearing			
8	Bakerwals have good health and stamina during migration			
	Others (Please Specify)			
Physical assets				
1	The roads, tracks and terrains are safe for migration			
2	Transport facilities are available for carrying animals in emergency			
3	Pastoralists have adequate sheltering arrangements at summer and winter pastures and migration			
4	Mobile schools and other infrastructure facilities for children, available are adequate			
5	Banking and credit facilities are available and accessible to you			
6	There is adequate availability of human and veterinary health services at winter and summer pastures and during migration			
7	Energy sources like electricity, fuel wood, and kerosene are available in your locality			
8	Government (SAHD) frequently provide warning calls for adverse weather conditions			
	Others (Please Specify)			
Financial assets				
1	Goat and Sheep act as primary source of livelihood for pastoralists			
2	Pastoralists have more liabilities compared to assets			
3	Pastoralists have sources of livelihood other than animal rearing			
4	Goat and Sheep act as moveable assets and secure future of your family			
5	Sheep and goat are useful as sacrificial animals and also used at marriage, birth and death ceremonies			
6	There are adequate institutional credit/loan facilities in your locality			
7	Take the animals of other fellows for pasturing, if self owned flock is less to earn more income			
8	Collection and sale of forest products adds to adds to your income			
	Others (Please Specify)			

SA: Strongly agree; A: Agree; DA: Disagree

Perception of respondents about the Sources and level of Vulnerability/Insecurity

Sl.No	Sources of Vulnerability/Insecurity	Highly vulnerable	Vulnerable	Fairly vulnerable	Not vulnerable
1	Poor veterinary health services				
2	Poor economic and education status				
3	Lack of Mandis or organized markets				
4	Animal diseases causing high morbidity and mortality				
5	Lack of feeding resources in part of winter				
6	Lack of skills in livelihoods other than animal rearing				
7	Inclement weather conditions				

Perception of respondents about the factors needed to improve livelihood

	Sources of Vulnerability/Insecurity	Very important	Important	Not important
1	Support from other farming/agricultural communities			
2	Efficient animal health coverage			
3	Socio-political capital formation			
4	Child education			
5	Collective action			
6	Government support			

SWOT analysis of small ruminant rearing utilizing AHP among Bakerwals of Jammu and Kashmir

Strengths	
1	Small ruminant rearing is primary reliable source of subsistence, sustenance and livelihood
2	Synchronous adjustments and adaptability of pastoralists and their flocks
3	Pastoral mode of life ensures low /minimum input rearing of livestock
4	Huge availability of pasture and rangelands
5	Conservation of indigenous small ruminant genetic resource
Weaknesses	
1	Less profitability of small ruminant rearing
2	Illiteracy and skill-lessness
3	Lack of public infrastructure and Govt. services
4	No land ownership for permanent settlement and agriculture (unlike agro pastoralists)
5	Societal isolation
Opportunities	
1	Scope for establishment of organized markets and processing units
2	Establishment of state affiliated pastoral organizations/associations/Panchayat systems
3	In context and favorable Govt. policies
4	Biodiversity conservation and sustenance of happy pastures
5	Necessity of plant and animal scientific interventions
Threats	
1	Changing land use pattern
2	Geo-political tensions
3	Health concerns (Zoonosis, Anthroponosis and emerging and Re-emerging diseases)
4	Unpredictable climatic pattern
5	State and central Government apathy

S: strength; W; weakness; O: opportunity; T: Threat

Annexure

Annexure 1

The selected indicators of the respective dimensions of PLSI with their relevancy weightage (RW) and mean relevancy scores (MRS)

SI No	Dimensions and indicators	RW	MRS
A	Natural assets	0.957265	2.871795
1	Pastures are well available and accessible to you for grazing of animals	0.803419	2.410256
2	Your recognized pastures are sufficient in quantity and quality for grazing of your animals	0.752137	2.25641
3	Condition of pastures is deteriorating over period of time (poisonous plants)	0.82906	2.487179
4	Over grazing and browsing is affecting land and vegetation	0.786325	2.358974
5	There are sufficient water sources/points along the route of migration	0.803419	2.410256
6	Productive & reproductive performance of existing sheep and goat breeds is satisfactory	0.863248	2.589744
7	Weather and climatic conditions are conducive for rearing of sheep and goat	0.803419	2.410256
8	Natural disasters/ calamities affect the flock size	0.957265	2.871795
B	Social assets		
1	Bakerwal community strong intra social relationship	0.923077	2.769231
2	Social groups like CIG's, SHG's etc are existing in your community	0.760684	2.282051
3	Bakerwal are well adjusted with the culture of other pastoral and semi-pastoral communities in the area (agro-pastoral)	0.863248	2.589744
4	Pastoralists suffer loss due to stealing of animals during migration	0.863248	2.589744
5	Bakerwal have a direct linkage with various market development agencies	0.888889	2.666667
6	There are adequate social institutions for interaction/participation	0.948718	2.846154
7	Pastoralists have good social networks to update the latest technical knowhow	0.888889	2.666667
8	Rules and regulations of the forest department are unfavourable for grazing of animals	0.820513	2.461538
C	Human assets		

1	Pastoralists have adequate planning and decisions making abilities for successful livestock business	0.880342	2.641026
2	Pastoralists have relevant indigenous traditional knowledge in tracking environmental conditions	0.905983	2.717949
3	You well versed with the identification of various forest plants of economic importance	0.905983	2.717949
4	Bakerwal pastoralist have good expertise in breeding, health care and marketing activities of livestock	0.752137	2.25641
5	You have good knowledge of symptoms and indigenous management of various disease conditions	0.905983	2.717949
6	Pastoralists have skills for pursuing livestock rearing in adverse conditions	0.880342	2.641026
7	Family member are competent enough to perform other job than animal rearing	0.760684	2.282051
8	Bakerwals have good health and stamina during migration	0.760684	2.282051
D	Physical assets		
1	The roads, tracks and terrains are safe for migration	0.880342	2.641026
2	Transport facilities are available for carrying animals in emergency	0.948718	2.846154
3	Pastoralists have adequate sheltering arrangements at summer and winter pastures and migration	0.82906	2.487179
4	Mobile schools and other infrastructure facilities for children, available are adequate	0.91453	2.74359
5	Banking and credit facilities are available and accessible to you	0.837607	2.512821
6	There is adequate availability of human and veterinary health services at winter and summer pastures and during migration	0.923077	2.769231
7	Energy sources like electricity, fuel wood, and kerosene are available in your locality	0.888889	2.666667
8	Government (SAHD) frequently provide warning calls for adverse weather conditions	0.871795	2.615385
E	Financial assets		
1	Goat and Sheep act as primary source of livelihood for pastoralists	0.974359	2.923077
2	Pastoralists have more liabilities compared to assets	0.846154	2.538462

3	Pastoralists have sources of livelihood other than animal rearing	0.854701	2.564103
4	Goat and Sheep act as moveable assets and secure future of your family	0.940171	2.820513
5	Sheep and goat are useful as sacrificial animals and also used at marriage, birth and death ceremonies	0.82906	2.487179
6	There are adequate institutional credit/loan facilities in your locality	0.905983	2.717949
7	Take the animals of other fellows for pasturing, if self owned flock is less to earn more income	0.837607	2.512821
8	Collection and sale of forest products adds to adds to your income	0.820513	2.461538

RW: Relevancy Weightage; MRS: Mean Relevancy Score