

## KNOWLEDGE LEVEL OF FARMERS AND MIGRATORY ROUTE OF PASTORAL COMMUNITIES IN RELATION TO GRASSLANDS IN ARID ECO-SYSTEM OF INDIA

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### ABSTRACT

The observed results revealed that the total area available for grazing accounts for about 40% of the geographical area of India. Further in eight states, over 50% area is utilized for grazing. However, grazing area is much higher i.e. over 70% in the states of Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh, Uttaranchal, Meghalaya, Nagaland and Arunachal Pradesh. The introduction of clover (Berseem) in India after independence could found place in assured supply of moisture, in rabi season. The medium size of land holdings were found more concern about knowledge level of farmer and farm women on fodder for livestock and grassland in India.

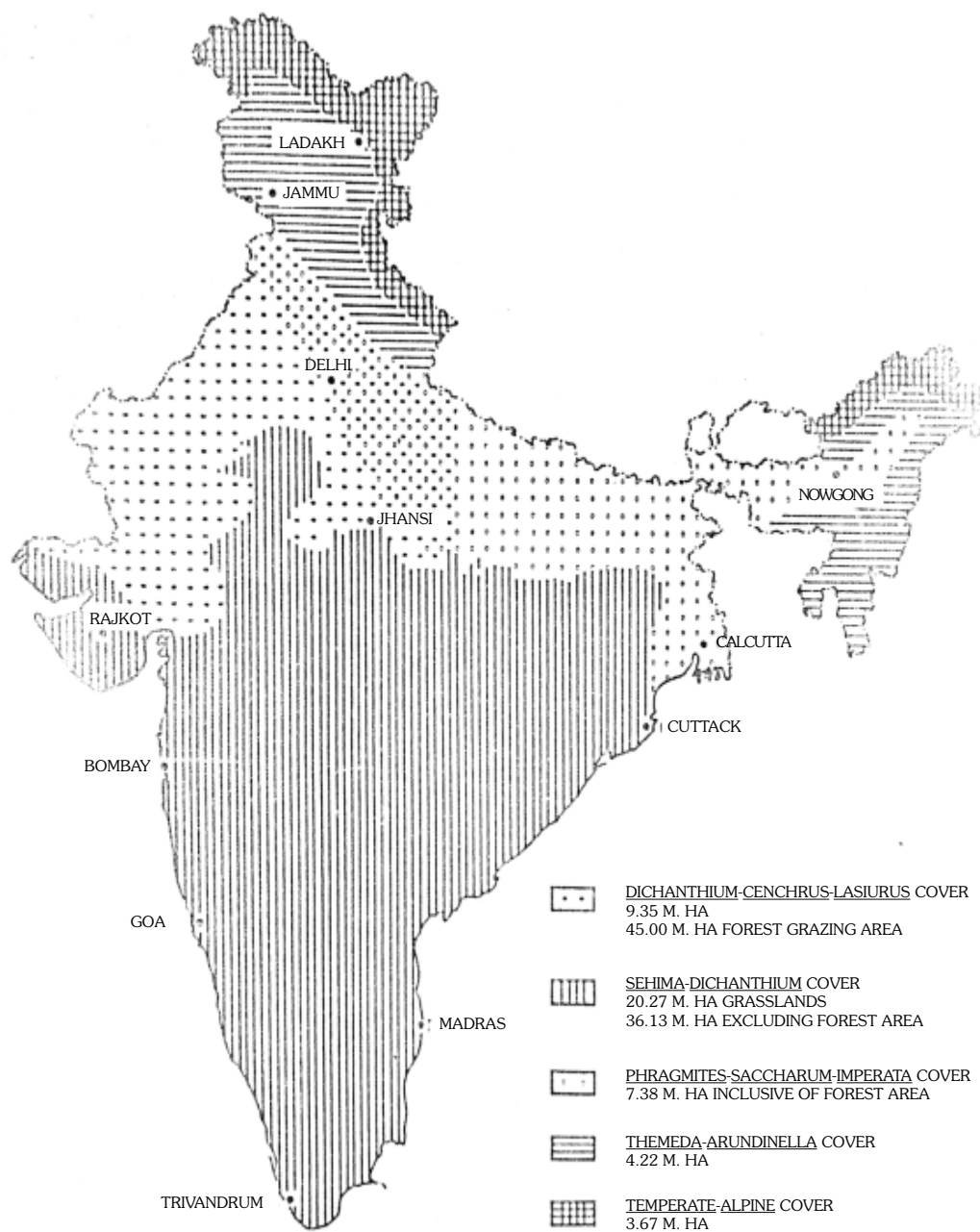
### INTRODUCTION

The grassland normally considered to be the cheapest source of livestock feed are in a degraded and denuded state because of over grazing and faulty management over the ages. Thus the amelioration of the natural grasslands and pastures deserve special and careful attention on priority in our drive for increasing forage production. The grassland survey carried out by ICAR has led to the recognition of five distinct grass covers out of which four grass cover are there in the plains and lower hills in tropical and sub-tropical regions and one at high altitudes in the alpine, sub alpine and temperate regions, (Fig. 1). Though we have excellent grasses in our natural grasslands yet owing to the continual use and misuse of grasslands, for decades in the past, the proportion of perennial species has considerably dwindled, resulting in the preponderance of annual, inferior and less palatable grasses, coupled with a high density of undesirable bushes and shrubs. Thus, these reservoirs of forage require careful attention, care and scientific management for sustainable livestock production. Thus we have to manage our grasslands through the process of scientific interactions with the society: viz., Amelioration of degraded lands, Soil and water management, Vegetation Management,

Harvesting and grazing management with existing crops and cropping systems, Best utilization of Agroforestry systems, Enrichment of fodder through artificial chemicals/fertilizers.

### MATERIAL AND METHODS

The study was carried out in the administrative control of Indian Grassland, Fodder and Agroforestry Research Institute, Jhansi which is located at 25.37°N latitude, 78.35°E longitude and 271 m above mean sea level. The survey work was continued in consecutive during 1991 to 1999. The study was carried out in purposively five-selected region. The grassland survey carried out by ICAR has been led out the recognition of five distinct grass cover out of which four grass cover are there in the plains and lower hills in tropical and sub-tropical regions Dharwad (Karnataka), Avika Nagar (Rajasthan) and Palampur (H.P.). Thus blocks is selected in each region and one village in each block. Fifty farm families from each village were randomly selected for the study. Thus a total farm families from each four region constituted the sample. The data regarding knowledge possessed by the farmers that are grasses and their varieties for animal grazing were collected with the help of pre tested structured scheduled by personally interviewing the respondents.



**Fig. 1.** Distribution of grass covers in India

## RESULTS AND DISCUSSION

### Grazing in forest lands as permanent pasture

It was found that the 12 m ha Pastures account for 3.95% of geographical area of the country and form the main grazing resource. At present 8 states of India have higher proportion of land under pastures than the national average of 3.95%. These states are Himachal Pradesh, (36.4%), Sikkim (13.3%), Karnataka (6.5%), Madhya Pradesh and Chhattisgarh (6.3%), Rajasthan (5.39%), Maharashtra (5.1%) and Gujrat (4.5%). While the other states stand below the national average (3.95%) of grazing resources (Table 1). The land demarcated for grazing generally belongs to the communities of a single village in clusters. These may also be the state owned land meant for the grazing purpose. On such areas most of the village households keeps some livestock's which are taken away by cowherds to the village grazing lands called Gochars early in the morning and bring them back in the evening. Cattle, buffaloes, goats, sheep, donkey graze together on the same piece of land. In most cases Gochars (shepherds) who take care of animals also bring one or more dogs with them to assemble the animals in the heard. The shepherds always lop tree leaves with traditional implements for their heard. Over a period of time, these gochar lands have been neglected and except during rainy season they do not produce any substantial green grass. Due to all round development and encroachment by the educated society, part of these gochar lands are either in illegal possession of a few persons or transferred to the landless families including scheduled castes and scheduled tribes. These gochar lands further threatened by the different types of anti social elements.

### Present status of pasture in India

The pasture is spread in following four regions:

I Pastures of northern region

II Pastures of western region

III Pastures of the Indian peninsular tract

IV Pastures of the eastern region.

### I. Pasture of northern region

This region has a potential resource in the form of green meadows and pastures, which at some place are mixed with the forests. The alpine meadows called Mags, are of economic importance as these provide grass to the migratory livestock owned by Bakarwals and the Gujjars moving across the mountains with their flocks of cow-sheep-goat tract (Fig. 2). The villagers take their livestock's to the mountain glades. There are upland pastures beyond 2743 m altitude in Ladakh region, which are grazed by yaks, donkeys, ponies and goats particularly on favourable slopes. The estimate shows that 10% of the total area of Ladakh district is under grazing land and pasture. Clover (berseem) + mustard and napier-bajra-hybrid, berseem-mustard are popular crop rotation in the area and produced 120-135 t/ha/year green fodder with wheat and maize.

The grazing areas of Himachal Pradesh safely divided in two broad categories i.e. (I) Grasslands of lower hills and (II) Grasslands of higher altitude. The grasslands of lower hills include the tropical and sub-tropical (300-1525 m), while the grasslands of higher altitude, temperate (1525-3650m) and alpine (3650-4600m) meadows. Excessive grazing and lopping of trees has done a great damage to the tropical and sub-tropical forest and pastureland. Grasslands that are used by the migratory flocks of sheep and goats characterize the Temperate Zone. The tree line is reached at about 3950 m beyond which are the Himalayan meadow where the dense cover of moist alpine scrub forest is found in patches broken by grass in between. The Brahmour region and Bara Bengal tract of Kangra are inhabited mostly by the Gaddis who keep large flocks of sheep and goats. The grazing density

**Table 1.** Statewise land resources available for grazing in India (thousand ha)

States	Forest	Pasture	Misc. tree crops etc.	Cultivable wasteland	Total area for grazing
Andhra Pradesh	6200	901	276	894	11488
Assam	1985	184	250	107	2703
Bihar and Jharkhand	2923	142	232	418	6880
Gujrat	1966	845	4	1989	5605
Haryana	130	27	<	47	390
Himachal Pradesh	862	1166	40	129	2251
Jammu and Kashmir	2759	123	94	145	3217
Karnataka	3030	1246	337	485	6476
Kerala	1081	5	55	129	1340
Madhya Pradesh and Chattisgarh	14006	2806	167	1742	20396
Maharashtra	5303	1572	185	987	9713
Manipur	602	<	24	<	626
Meghalaya	812	17	145	454	1740
Nagaland	288	-	200	62	909
Orissa	6640	559	409	245	8635
Punjab	221	4	5	33	296
Rajasthan	2163	846	82	5741	13602
Sikkim	205	97	2	1	374
Tamil Nadu	2030	151	183	316	4777
Tripura	578	<	98	2	682
Uttar Pradesh and Uttaranchal	5121	298	549	1121	9029
West Bengal	1091	7	57	176	1874
Arunachal Pradesh	5150	-	35	173	2796
Others	2116	11	33	173	2796
All India	67334	12002	3462	15451	121121

0.21 ha per adult cattle unit in Himachal Pradesh. In this region the per cent grass cover varies from 16.8 to 88.9 in different situations. The socio-economic status of local residents very much influenced due to more intensity of biological diversified grass species. Due to large variation in climatic conditions and soil type-lower biomass production has been estimated from 44 to 1077 kg dry matter/ha.

However, production potential of mono-cropping in sub-tropics to lower temperate has been estimated as 3000 kg dry matter/ha of *Chrysopogon fulvus* and 21060 kg dry matter ha of *Setaria sphacelata* (Singh, 1980). This suggest that the introduced exotic species of improved grasses may be grown with popular crops and cropping systems that could enhance the production, socio-economic status as well as productivity of pastoral communities (Tyagi and Singh, 1988). The Gujar, Gaddi,

Khauras are the broad pastoral communities in this region. Beside the forage crops farmers are growing wheat, maize, rice and potatoes.

**i) The pasture of Bhabar:** The forest grazing lands where the pastoral communities from northern Uttaranchal and Himachal Pradesh stay throughout the winter season. *Eulaliopsis bipanata* a popular grass for grazing and rope making is mainly known as Bhabhar grass up to plains of Chandigarh also (Fig. 4). The pasture of Bhot region - The region across the southern slopes of greater Himalayas up to Tibet is known as Bhot, after Bhotias who graze the sheep and goat in this region. Beyond the height of 3350-3650 m the trees are rarely found. From here starts Bugyls and at 5180 m height. The Pyars become smaller and scattered with the increase in altitude. Beyond Gaumukh there are several Pyars

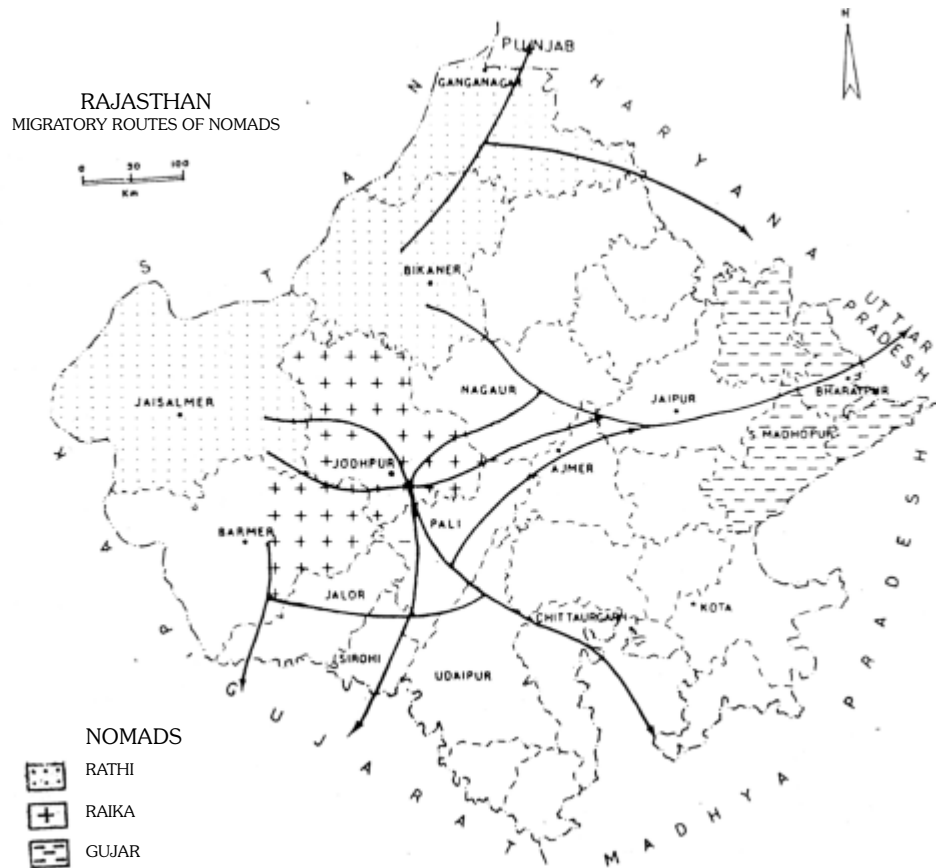


Fig. 2.

which are utilized by Botias, Khadwals, Gaddis, Marchhas and Jodhs. Gujjars also graze their animals in the lower pasturelands. The animals usually grazed in this zone from June to October. Berseem + mustard in winter and napier-bajra-hybrid as perennial forage crops popular in the region with wheat, rice, maize and potatoes. *Themeda* and *Aurendenala* are the popular grass covers the region.

**ii) The pastures of pahar region:**

Toward the south of Bhot region up to Bhabhar the region is known as pahar. The inhabitants of this region graze their animals in the pyars/bugyals during summer and in the neighboring

villages and ranges during winter. The northern part of pahar region known as Rath- is more suitable for grazing particularly for sheep and goats rather than agriculture. On southern slopes of the greater Himalayan, below snow line there are very good pyars and down of these bugyals in Uttarakashi, Chamoli and Pithoragarh of Uttaranchal. The region has many hills, which are not very high. The hills are covered with green forest. Thus the Shivalik range of the region is regarded as a storehouse of wood. The Khadwals who graze their animals on slopes of the mountain ranges. They also practice lopping of trees to provide



Fig. 3.

forage to their livestock's. Due to undulating topography of Khadwal area, it is difficult to raise cattle and buffaloes. The southern belt of pahar region is known, as slant where agricultural becomes the primary and grazing the secondary occupation. However, the cattle and buffaloes are raised on the plateau areas of 1525-1825m height. Thus the system of grazing is practiced a Kharak system. Maize, oats, wheat and rice food-fodder crops are grown in the valley region with multipurpose tree species of cherry, apple, khumani, akhrot, peach, plum and pear.

## II. Pastures of Western Region

The temperature of arid region is very high throughout the year. The average soil

temperature at 30 cm depth found about 30° except in winter. A maximum soil temperature of 50° to 60°C has been recorded during summer months. Simultaneously concentration of rainfall in a well defined period makes it quite effective for biological activity, this period is also one of high atmospheric humidity and moderately warm temperature. Therefore, an impressive biomass of ephemerals/napier-bajra-hybrid grasses and legumes like *Cenchrus*, *Lasuaris*, *Stylo*, *Panisetum* etc. (complete their life cycle in short span of 5 to 8 weeks) built during this period. Due to heavy livestock pressure on these aridisols. Cattle consume overground biomass, buffalo, donkey, Camels, rabbit Sheep and goats of domestic and wild animals. And the organic residues are



Fig. 4. Distribution of pastoral communities in different parts of India

rapidly mineralized due to high temperature. Thus built-up organic matter status of these soil is very poor and low. In the rainfall zone below 30 cm, the organic carbon content ranges from 0.05 to 0.2% in sandy soils, 0.2 to 0.3% in medium textured soils and 0.3 to 4% in the fine textured soils.

**i) Aridisols:** These soils occur in hot desertic region, extending, over approximately 290,000 km<sup>2</sup> in the north-western parts of India. Much of desert boundary surrounded and share with Pakistan (narrow international boundary). However, the socio-economic status of general public, their lively hood and all round

development depends up on natural resources live soil, water and bio-diversity of the region. Thus aridisols spread in Rajasthan, Southern part of Haryana and Punjab and northern part of Gujrat. The rainfall range from 500mm to 100mm, the major portion being received during the monsoon (July to September). While potential evaporation is 2060 to 1620 mm, showing net aridity mean net loss in conserved moisture. A major part of the region consists of sand dunes and undulating sandy plains. However there is a sizable area with a considerable variety of soil resulting from variability of source rock, parent material and history of evolution of the landscape.

**ii) Minerals:** Clay minerals are mainly inherited from the parent materials. The soils clays are dominantly illitic. with smaller amount of kaolinite and in a few cases chlorite and vermiculite. While in Haryana and Punjab there assured supply of moisture exist the desert soils found as calcareous sierozems. There these parts have been considered as Entisols. About 40% area of Rajasthan and Gujrat is available for grazing pasture in cultivated belts and 80% of extremely arid districts area are available for grazing. While 50% of hilly areas are under grazing (Tyagi and Singh 1988). Gujrat living desert Banni a long tract of land in Kutch, which is one of the largest grassland in the Asia. The grasses, which grow here, have rich herbage for cattle i.e. *Lasuaris indicus*, *Cenchrus ciliaris* and *Cenchrus setigeris* are the predominant grasses. Among the trees, *Prosopis cinararia* (Khejri), *Azadirachta indica* (neem) and *Acacia sp.* (Babool) are the popular species with *Pennisetum gluicum* (Bajra) and guar. Here live the proud of Maldaris the cattle breeders. There are other tracts also in Saurashtra, which have large number of cattle breeders. The average nutritional values of important arid and semi-arid pasture grasses presented in Table 2. Which further indicate dominance of cenchrus. Lasuaris due to high

amount of protein. The Rathi of Jaisalmer, Bikaner and Sri Ganganagar migrate towards the other adjoining districts. The Raikas of Jodhpur, Barmer migrate towards Gujrat, M.P., U.P. and Haryana during summer months (Fig. 3).

**iii) Sands and sand dune:** The sands constituting the sand might have been affected due to temperature from Rann and Lawn Indus basin or constitute the break own of the light textured soils of the plains. The soils in the plains are mostly derived from alluvium and are pale brown to yellow brown, fine sandy to loamy fine sand, and mostly structure less, due is lack of proportionate silt and clay. A zone of accumulation of lime or lime concretions at a depth of 60 to 120 cm is of common occurrence. As detailed in Fig. - quite often a weakly developed B horizon is observed. In this old alluvial as observed in Pali in Rajasthan, there is a evidence of clay illuviation and the formation of an argallic subsurface horizon. The pressures or accumulation of alkaline earth carbonate is a striking feature of most soils. The clay content is very low (2-8%). The presence of sodium clay makes the soils susceptible to dispersion and less permeable. A nitric horizon is also observed. Thus pH of the soils range from 8.0 to 8.8. Soils contain soluble salts, but the concentration is not at the toxic level. Nitrogen content is low, but the level of nitrate nitrogen is high. But presence of phosphate and nitrate make the desert soils fertile and productive under moisture supply. This region also influence the intensive crop cultivation in, Indo-Gangatic plains and created number of obstacles as also advocated by Lal *et al.*, 2004; Lal 1993, 1994.

### III. The pastures of Peninsular India

A vast stretch of land lies in the Deccan plateau in the states of Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu. This tract, often known as famine area,



**Table 2.** Nutritive value and biomass production potential of range grasses in arid and semi-arid areas

Species	Protein (%)		Phosphorus (%)	Dry biomass t/ha
	Crude	Digestive		
<i>Cenchrus ciliaris</i>	12.82	8.60	0.51	2.2
<i>Cenchrus setigerus</i>	8.77	4.89	0.60	2.7
<i>Panicum antidotale</i>	12.24	8.07	0.48	2.8
<i>Dicanthium annulatum</i>	5.05	1.48	0.48	3.2
<i>Lasuaris indicus</i>	9.05	5.15	0.56	2.9

**Table 3.** Knowledge level of farmers and farm women in grasses, fodder crops and grasslands

Level of knowledge on grasses/grassland	Av. of the collected sample (%)	
	Farmers	Farm women
Low	35.00	24.00
Medium	52.00	40.00
High	12.00	10.00
Without knowledge	0	36.00

receives less than 50 cm annual rainfall. The tract is rocky stretch with boulders and gravel's. By and large, it is a pastoral tract with the major portion of the land being under grazing by sheep's and cattle. Sheep of the tract live solely on grazing without any supplemental feeding. The Ahir, Dangar, Kuruba, Golia, Labuda, Sugali Golla, Toda, Kuruba, Yadav, Idalyan are the popular pastoral communities. These communities migrate with their animals on the grazing ranges. *Dichanthium annulatum*, *Sehima nervosum* are the most popular grasses in these states. The Ahir and Gowari near Nagpur and Chandrapur migrate towards Konkan. Similarly Kuruba and Gols communities migrate with their livestock from Kohlapur and Solapur to Konkan region. Sorghum, rice, groundnut, coconut, tapioca, cowpea, napier-bajra-hybrid, ragi, lucerne etc. are the popular food-fodder crops of the region.

#### IV. The pastures of Eastern region

Eastern has very little area under pastures, except Sikkim 13%. In Manipur, Meghalaya, Nagaland, Tripura, West Bengal and Bihar states pasture are below one per cent. In eastern part large area under forest of

good quality and lacking suitable grasses for grazing. Thus grazing is not much popular in eastern part. *Sehima*, *Daichanthium*, *Saccharam*, *Bothrichloa*, *Themada*, *Arundinella* are the common grasses found in entire eastern region. However, alpine grass cover limited only in the Arunachal Pradesh and Assam states. Rice, oats, cowpea, jute, mustard *with napier-bajra-hybrid* and *Deenanath* grass are the popular crops in eastern region.

**Knowledge level of farmers and farm women:** Majority of the medium holding farmers growing fodder crops/Grasses were found that 52 per cent had up to date knowledge about grasses and their varieties and grassland management. This was followed by small 35 per cent and large holding farmers 12 per cent. Where as the proportion of large holding farmers having high level knowledge was meager 12 per cent and farm women knowledge 10 per cent. Thus 52 per cent small category of farmers were having high level of knowledge and farm women (40 per cent). While only 12 per cent farmers and 10 per cent farm women in category of larger farmers had knowledge of glasses and their varieties/

Grassland management. In small category of farmers and farm women of the knowledge were in the range of 35 per cent of farmers and 24 per cent in farm women. Thus in rest of 36 per cent women were not aware in about the Grasses and their varieties in small category (Table 3). These results are in agreement with the results of Suman *et al.*, 2002 in relation to adoption of agricultural technologies on farmer fields.

### CONCLUSION

The introduction of various fertilizers, chemical and pesticides etc. after 2nd world war force the farmers to use these materials to boost the agricultural production as well as productivity to feed the ever increasing population of the world. Further, spreading of high yielding varieties of food crops *viz.*, Wheat, rice etc. with increasing irrigated area also threatened the natural resources like soil,

water and biodiversity. Thus the existing crops and cropping system changed to some extent and migration of pastoral communities due to intensive crop cultivation as well as monoculture. Due to these introductions soil become sick as imbalance nutrient supply and killing of beneficial macro and microorganisms in the soil. The migration of pastoral communities such as Gaddis, Bakarwal, Rathi, in western Himalyan and Gola ahir in eastern Himalyan continue. Similarly Rathi, Raika and Gujar in the western dry arid region *viz.*, Rajasthan, Gujrat and Madhya Pradesh influenced to the large extent. Thus the carbon and nitrogen balance of soil destroyed. Therefore, there is a dire need to follow traditional indigenous practices for sustainable conservation, maintenance and development of flora and fauna in the natural Eco-system.

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