

Identification and characterization of pastureland and other grazing resources of Jammu & Kashmir using GIS and Satellite Remote Sensing technique

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Introduction

Livestock acquires special importance in mountain farming system from both ecological and socio economic point of view. They are an integral part of the farming system and a “bridge” connecting two types of land viz., forest and cultivated. In hilly regions, the arable agriculture is not very remunerative; therefore farmers of all categories rear sheep, goats, cattle *etc.* under sedentary, semi-migratory and migratory systems to supplement family income (Dev *et al.*, 2014). The common property resources (CPR) and degraded pasturelands are the major feed sources. Remotely sensed satellite imagery and Geographic Information System (GIS) are being widely used for the assessment of pasturelands and estimation of forage availability as well as monitoring of the range resources (Singh *et al.*, 2011). Since, the grazing resources are limited and natural grasslands are becoming scarcer, there is a greater need to effectively manage grasslands for optimum forage production and eco-development (Roy and Singh, 2013). Precise information on extent, condition and forage availability is essential for developmental planning. In the present study information on current status of pasturelands in Jammu and Kashmir based on remotely sensed satellite data and GIS/ GPS is carried out.

Materials and Methods

The Study Area: Jammu and Kashmir located between 32° 17' 37.50" N and 72° 40' 80.30" E occupied a strategic position in India with its borders touching Afghanistan in the N.W., Pakistan in the west and Tibet (China) in the north and east. The state as a whole covers an area of 2, 22,800 km².

Tools and software used: ArcGIS Arc-Info and ERDAS Imagine software's were used for the data correction, interpretation, analysis and mapping of grasslands. GPS (Garmin GPSMAP276) linked intensive ground truthing (GT) and field samplings were carried out to generate the geo-spatial information on pasturelands. These pastures were assessed, sampled and GPS locations (66 points: latitude, longitude and altitude) were recorded for the supervised image classification of satellite images.

Dataset used: Satellite images (IRSP6L3B4 dated 2012; 21 scenes) of J&K were rectified, geo-referenced, projected and final FCC mosaic (Fig 1) of the state was generated and classified.

Grassland Mapping: Classified satellite image converted to grid – poly – *.shp and finally created geo-database and thematic map using ArcMap.

Results and Discussion

The study reveals that in the state of Jammu & Kashmir about 9595 km² (4.32%) area is under pasturelands of the total geographical area (Table 1). It is clearly depicted in the table 1 that the area under grasslands in Jammu, Kashmir and Ladakh were 3.53, 13.22 and 5.76 percent respectively together contributing about 6756.5 km² or 6.34%. Where as in POK it was 2.16% and in China occupied area it was 3.04 percent. The study further reveals that about 70% of good grasslands of the state is under the administrative control of India (Fig. 2).

Cold desert pasture of Pang- Changthang – Nubra was assessed as 5.76% of the total area. Major grasses were *Agropyron lange-aristatum*, *Elymus sibiricus*, *Kobresir*, *Erotir*, *Caragana*, *Festuca*, *Ranunculus*, *Pedicularus* spp. and major Legumes were *Medicago*, *Lotus corniculatus*, *Astragalus tribulifolius* found above 2800m whereas between 3500-4500m important species were *Poa pratensis*, *Festuca rubra*, *Bromus macrostachy*, *Elymus sibiricus*, *Agropyron lange-aristatum*, *Medicago sativa*, *M. falcata*, *M. media*, *Lotus corniculatus*, *Astragalus tribulifolius*. Highest CP content (14.89%) was recorded in Zanskar valley due to dominance of *Trifolium* and *Lolium* species in the grasslands. Various temperate

grasses, which can be tried for pasture development in Ladakh are *Festuca arundinacea* (Tall fescue), *Bromus inermis* (Smooth brome grass), *Lolium perenne* (Perennial rye grass), *Phleum pretense* (Timothy), *Dactylis glomerata* (Orchard Grass) and *Agropyron spp.* The legumes include *Lotus corniculatus* (Bird's trefoil), *Lupinus spp.* (lupin), *Trifolium pratense* (Red clover) and *T. repens* (white clover). In Jammu region important grasses/legumes species were *Chrysopogon echinolatus*, *Setaria viridis*, *Sacchaum spontaneum*, *Desmostachya spp.*, *Themeda anaethera*, *Heteropogon contortus* *Trifolium repens*, *Agrostis canina* etc. About 6t/ha/year (fresh weight) and 1.8t/ha/year (dry matter) was recorded as existing forage production from mid hills. Due to presence and at some places dominance of legumes especially clover the CP was recorded as 6.67%.

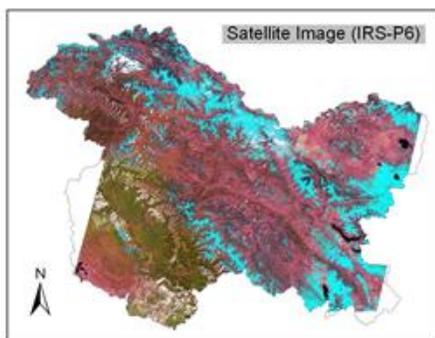


Figure 1



Figure 2

Fig1: IRSP6L3 image of J&K

Fig 2 Spatial distribution of grasslands

Table 1: The status of area under pasturelands and other grazing resources

Region	Geographical (km ²)	Area under pasturelands and other grazing resources	
		Area (km ²)	Area in percentage
Jammu	25636.16	906.09	3.53
Kashmir	15936.43	2106.59	13.22
Ladakh	64957.76	3743.86	5.76
(JK India)	106530.35	6756.54	6.34
POK	77338.76	1673.92	2.16
Aksai Chin	38366.89	1164.58	3.04
Total	222236.00	9595.04	4.32

As per the variation in elevation, the vertical distribution of pasturelands is shown in table 2. It was found highest (6.72%) between 1500-4500m. The area under pasturelands and other grazing resources of the state was classed as tropical, tropical to sub-tropical, sub-tropical to sub-temperate, sub-temperate to alpine and alpine meadows. It is evident from table 2 that minimum area under grassland (0.36%) is available in low hill region (Below 500m) as much of the area have been brought under cultivation of cereal crops.

Table 2: The vertical distribution of area under pasturelands and other grazing resources

Elevation (m)	Geographical (km ²)	Area under pasturelands and other grazing resources	
		Area (km ²)	Area in percentage
Below 500	6836.33	24.41	0.36
500-1000	10768.47	85.46	0.79
1000-1500	10349.04	546.60	5.28
1500-3000	30369.48	2039.33	6.72
3000-4500	52891.77	3250.24	6.15
Above 4500	111020.91	3648.99	3.29
Total	222236.00	9595.04	4.32

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