International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE)

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122| || A Monthly Peer Reviewed & Referred Journal |

||Volume 9, Issue 8, August 2020||

Biodiversity Conservation in the Thar Desert-Emphasizing on Medicinal Plants

Dr. Sanjay Kumar Acharya

Department of Botany, Govt. Dungar College, Bikaner, Rajasthan, India

ABSTRACT: The Indian desert, the Thar Desert, has its own importance and specific characteristics with respect to endemic and medicinal plants. Forty-five plant species are considered to be rare and/or endangered. The desert has a large number of plants of economic importance and medicinal use. The Thar Desert is thickly populated in comparison to other hot deserts of the world. 17.44 million people and 23.33 million livestock are recorded from the region. These populations exert pressure on the biological resources of the Thar Desert causing a lack of sustainability and necessitate conservation of biodiversity actions.

KEYWORDS: Thar, desert, plants, economic, biodiversity, medicinal, conservation

I. INTRODUCTION

The Great Indian Desert known as the Thar Desert occupies about 60% of the area of Rajasthan – the largest state of India. It is one of the most heavily populated (in terms of both people and cattle) deserts of the world. The animal and human populations exert tremendous pressure on the scant vegetation of the region, making several plants vulnerable to becoming endangered. Inherent biological problems associated with these plants make their survival difficult and have forced adaptation to the harsh environment. The biological activities of these plants range from analgesic, antifungal, antimicrobial, hypolipidemic to hepatoprotective and anticancerous. [1,2,3]This chapter reviews the biological problems faced by the medicinal plants of this region, their bioactive molecules, as well as biotechnological approaches aimed at improving and conserving these plants.

The Thar Desert is the world's seventh largest desert and is most inhospitable eeo-region in the Indo-Pacific region. It is spread over in the four states of India, and in Pakistan and covering an area of about 2,38,700 km2. There are as many as 157 species of plants with medicinal value. Medicinal value and usefulness of several species is yet to be studied and established. The diversity of the medicinal flora typical of desert ecosystem has immensc future prospects. The prominent families to which the majority of the medicinal plants of the arid zone belong are: Fabaceae, Asclepiadaceae, Malvaceae, Acanthaceae, Amaranthaceae, Convolvulaceae., Lamiaceae (Labiateae). The present study is aimed at indexing of all medicinal flora occurring in the Western Rajasthan of Indian desert and their uses for the benefit of the researchers to undertake studies on the prospects and potential of commercial exploitation.

II. DISCUSSION

India is having a critical blend of tradition and modernity. Apart from being one of the oldest civilizations in the world, it is one of the fastest growing economies (based on 2017-18 projections), supports second highest population (1.33 billion) and is the seventh largest in area (329 million hectares) in the world. Although well over half of the country's workforce (50 %) is still employed in the agriculture sector; it is having the unique geomorphological position as its mainland is separated from the rest of Asia by the Himalayas. The country has an astounding spectrum of habitats and ecosystems, existing over a wide range of latitudes and longitudes, confluence of[4,5,6] three global centers of origin of life (biogeographic Realms) and an extremely enriched flora and fauna. The unique mosaic of ecosystems and habitats in different bio-geographic zones of India has created a number of biodiversity-rich landscapes and the desert is one of that. The term biodiversity, coined in 1986 is most commonly used to define species diversity and species richness. Biologists most often define biodiversity as the totality of genes, species and ecosystems of a region. The Convention on Biological Diversity (CBD) defines biodiversity as the variability among living organisms from all sources and the ecological complexes of which they are a part- including diversity within species, between species and of ecosystems66. Sustainable development is one that meets the needs of the present without compromising the ability of future generations to meet their requirements. It is now well understood that if biodiversity is well-managed, sustainable pathway for economic development is very likely. Biodiversity provides goods and services that help in sustainable development at different levels59. It underpins the functioning of ecosystems on which humanity depends for a range of essential services – provisioning, regulating, cultural and supporting. Although, the demand for these

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122| || A Monthly Peer Reviewed & Referred Journal |

||Volume 9, Issue 8, August 2020||

services is likely to go up in the coming years as a result of the rapidly expanding global economy and increase in human population, which is expected to reach nine billion by 2050; loss in biodiversity is in five key factors viz., habitat loss; unsustainable use and overexploitation; pollution; invasive alien species and climate change41. The Millennium Ecosystem Assessment (MEA)64 estimated that over the past few centuries, humans have increased extinction rates of species by as much as a thousand times as compared to extinction rates by natural processes. Species in all taxonomic groups[7,8,9] with known trends are, on average, being driven closer to extinction, with amphibians and warm water reef-building corals being particularly vulnerable66. Nearly a quarter of all plant species is believed to be threatened. Some authors have even compared the present scenario to mass extinction events that have occurred a few times during the history of life on Earth35. Not only is the number of species on the decline, their populations and the ecosystems where they are nestled are also vanishing at a rapid pace. The population size or range (or both) of a majority of species is diminishing across a number of taxonomic groups64. The Global Living Planet Index, which monitors populations of selected vertebrate species, has fallen by over 30 percent since 1970; suggesting that, on average, vertebrate populations have declined by nearly one-third during this period67. Deserts are the very unique and important ecosystem harboring wider spectrum of biodiversity cut cross our planet along two fringes parallel to the equator, at 25°–35° latitude in both the northern and southern hemispheres.

III. RESULTS

The Desert Biome is defined climatologically as the sum of all the arid and hyper-arid areas of globe; biologically, as the eco-region that contains plants and animals adapted for survival in arid environments. Desert ecosystem is characterized by very low rainfall (< 400 mm), aridity, and very sparse presence of vegetation. Though appearing to be lifeless at first glance, deserts can harbor an astonishing and unique diversity of species, and biological communities of high conservation value. They provide migratory corridors for many species. Non-desert birds on cross-desert migration across the Sahara compete increasingly with the human population of the region for rare oases that cover only two percent of the area. The desert locust (Schistocera gregaria) is normally found in 25 countries of the Sahel and the Arabian Peninsula, but during epidemic outbreaks[10,11] can spread over upto 65 countries, consuming 100000 tons of vegetation a day, from India to Morocco and even crossing the Atlantic to the Caribbean and Venezuela20. Deserts have provided trade corridors from times immemorial through which goods and cultures travelled. Because of their warm climate, deserts also export agricultural products, produced under irrigation, to nondesert areas. Agriculture and horticulture are already profitable in many deserts, as in Israel and Tunisia, and have great potential in Thar. A new non-conventional desert export is derived from aquaculture, which paradoxically, can be more efficient in water use than desert plants, and can take advantage of the deserts' mild winter temperatures and low cost of land. Biologically-derived valuable chemicals, produced by micro-algae as well as medicinal plants, are also manufactured in deserts, capitalizing on their high year-round solar radiation, and exported to global markets. Besides the ongoing export of wild plant products from deserts to non-deserts, there is a pharmaceutical potential in desert plants which is yet to be tapped. Here lies the trichotomy of the biodiversity, desert and sustainable development and it may be envisaged philosophically towards Castri's three legs of sustainability to derive a kaleidoscopic view on the potential of the Indian Thar Desert18,31. The Indian Thar Desert In India, the Thar, the smallest desert in the world, occupies nearly 385,000 km2 and about 9 per cent of the area of the country29,38. The only river that crosses through region is Luni, joining the Arabian Sea through the Rann of Kutch in Gujarat. It extends from Punjab through Haryana and Rajasthan to Gujarat. The Aravalli Mountains, starting from northern Gujarat and extending up to Delhi state, form the eastern boundary of the Thar. In the west it joins with the Thar Desert of Pakistan and in the south it extends into the Kutch of Gujarat .This Desert is the eastern extension of the vast PersioArabian desert, which joins the great Sahara deserts29,30,47. It is the most populous desert in the world, with human density of around 84 persons per km2. Population growth is also very high. For instance, between 1901 and 2011 decadal population growth in whole of India was 17.70 per cent; it was 23.56 per cent in the Thar23,36. More than 80 per cent of the people live in villages or scattered settlements called dhanis, but urbanization is increasing fast. This is an important bio-region of Rajasthan comprising about 61 percent of the state's total geographical area. It is one of the most biologically and culturally diverse Deserts of the world and houses distinct and unique ecosystems, landscapes and species of plants and animals. It is characterized by geomorphic forms and landscapes such as dunes, magras, dhands and bhakars, each with a distinct ecology of its own. This Desert results from the dryness of the prevailing monsoon winds, which do not bring sufficient rain to keep the region moist. The sand cover is of early Pre-Cambrian gneiss (granite-like metamorphic rocks formed in the oldest geologic era, which began 3.8 billion years ago), sedimentary rocks from about 2.5 billion to 570 million years old, and more recent material deposited by rivers (alluvium). The surface sand is aeolian (wind deposited) sand of the Quaternary Period (the most recent geologic period, which began about 1.6 million years ago). The desert presents an undulating surface, with high and low sand dunes separated by sandy plains and low, barren hills, or bhakars, which rise abruptly from the surrounding plains. The dunes are in continual motion and take on varying shapes and sizes. Older dunes, however, are in a semi-stabilized or stabilized condition, and many rise to a height of almost 500 feet (150 m). Several saline lakes,

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122| || A Monthly Peer Reviewed & Referred Journal |

||Volume 9, Issue 8, August 2020||

locally known as dhands, are scattered throughout the region5,19,26,37,39,56. Comprehensive studies on faunal diversity in the Thar Desert have been documented68. Three types of major terrestrial habitats are recognized in the Indian desert in relation to flora and fauna7,8,9,54 . Sandy: The sandy habitat occupies the largest area of the desert. Depending upon the soil type and topography, it can be further subdivided into (i) Younger alluvial plain, (ii) Older alluvial flat plains, (iii) Older alluvial hummocky plains, (iv) Saline flats, and, (v) Sand dunes. Mixed xeromorphic vegetation with trees such as Tecommela undulata, Prosopis cineraria, Acacia nilotica [8,9,10]and Salvadora oleoides; shrubs like Calligonum polygonoides and Haloxylon salicornicum; forbs like Tephrosia purpurea, Indigofera spp., Crotalaria burhia, Aerva tomentosa, Aerva persica and grasses like Cenchrus biflorus and Crotalaria ciliaris, Aristida spp., are common. Hills and Rocky Outcrops: Such outcrops are scattered all over the desert region. Anogeissus pendula, Acacia senegal, Euphorbia caducifolia, Maytenus emarginatus, Commiphora wightii and Cordia garaf are common trees, and Sehima nervosum, Cymbopogon jawarancusa, Hackelochloa granularis, and Dichanthium annulatum constitute the ground flora. Ruderal: This habitat is associated with villages which are scattered all over the desert, over rocky outcrops, sandy plains, sand dunes, saline flats and river banks. The luxuriant trees such as Azadirachta indica, Tamarindus indica, Prosopis cineraria, Acacia spp. Ficus spp. and Salvadora oleoides are the major species found in these regions.

Biological Diversity -The future of biodiversity and the very foundations of life on earth depend on this. Life on Earth is believed to have originated around 3.5 billion years ago. Over time, it evolved into myriad fascinating forms through the process of speciation. Some of these life forms were, however, lost along the way through extinction. The current stock of species is a product of these two processes occurring simultaneously over a long period of time. At present, approximately 1.75 million species have been formally identified. While estimates of the total numbers vary widely, some scientists believe that there may be as many as 13 million species living on earth33,34,64. India, with 2.4% of the world's area, has over 8% of the world's total biodiversity, making it one of the 12 mega-diversity countries in the world. This status is based on the species richness and levels of endemism recorded in a wide range of taxa of both plants and animals. This diversity can be attributed to the vast variety of landforms and climates, resulting in habitats ranging from tropical to temperate and from alpine to desert. Adding to this is a very high diversity of human-influenced ecosystems, including agricultural and pasture lands, and a diversity of domesticated plants and animals. India is also considered as one of the world's eight centers of origin of cultivated plants. Being a predominantly agricultural country, India also has a mix of wild and cultivated habitats, giving rise to very specialized biodiversity, which is specific to the confluence of two or more habitats. The tendency to classify ecological regions and plant and animal groupings, according to their geographical distribution and their essential similarities and differences, is not new. Traditional human communities did this on the basis of their own understanding, though their knowledge was necessarily somewhat restricted in its geographical spread4,28. Unfortunately, this aspect of traditional community knowledge is not receiving due attention presently. In modern times, bio-geographical classification, started in the latter half of the 19th century, is based on distribution of animals and plants21. An attempt to synthesize the two approaches on the combination of plant and animal distribution, is very recent, and has been prompted by the need to use such zonation in fixing conservation priorities49. Workers50 recognized ten bio-geographic zones divided into twenty-six biotic provinces in India (Table-1). Due to the diversified habitat and ecosystem, the vegetation, human culture and animal life in this arid region is very rich in contrast to the other deserts of the world. About 23 species of lizard and 25 species of snakes are found here and several of them are endemic to the region. The plant biodiversity [10]of Thar Desert is having great economic value which includes categories like plants yielding fibers, tannins, dyes, gum and resins, extraction and distillation products, plants for lac worm hosts, plant for silkworm hosts, biri leaves, soap substitutes etc. which can be broadly classified in the following categories3,14,27. Trees: Acacia leucophloea; Acacia nilotica; Acacia senegal; Acacia tortilis; Azadirachta indica; Ailanthus excelsa; Balanites aegyptiaca; Dichrostachys cinerea; Ficus benghalensis; Ficus religiosa; Holoptelea integrifolia; Prosopis cineraria; Prosopis juliflora; Tecomella undulata; Ziziphus mauritiana; Maytenus emarginata; Phoenix sylvestris; Riccinus communis; Terminalia alata; Terminalia arjuna; Cassia fistula; Cassia auriculata; Tamarix aphylla; Pithecellobium dulce; Acacia catechu; Zizyphus glaberrima; Terminalia bellirica; Emblica officinalis; Anogeissus pendula; Anogeissus latifolia; Prosopis cineraria; Garuga pinnata; Madhuca indica; Pongamia pinnata; Salvadora oleoides; Salvadora persica; Jatropha curcas; Balanites aegyptiaca; Sapindus emarginatus; Mimusops elengi; Aegle marmelos; Bauhinia racemosa; Boswellia serrata; Bombax ceiba; Buchnania latifolia; Butea monosperma; Leucaena leucocephala; Lannea coromandelica; Moringa oleifera; Mangiferaindica; Miliusa tomentosa; Pterocarpus marsupium; Sterculia urens; Nyctanthes arbortristis; Wrightia tinctoria; Morinda tinctoria; Helicteres isora; Cordia gharf; Erythrina suberosa; Phoenix sylvestre; Cordia oblique; Ficus religiosa; Morusalba; Diospryos melanoxylon; Diospryos tomentosa; Diospryos montana; Santalum album. Shrubs: Carissa carandas; Punica granatum; Lawsonia inermis; Rhus mysurensis; Mallotus philiphinensis; Capparis deciduas; Abutilon indicum; Sida cordifolia; Waltheria indica; Commiphara wightii; Hibiscus ovalifolius; Ziziphus nummularia; Acacia jacqumontii; Crotalaria burhia; Grewia tenax; Crotalaria medicaginia; Verbesina encelioides; Xanthium strumarium; Calotropis procera; Leptadenia pyrotechnica (Forsk.) Decne.; Sericostoma pauciflorum;

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122| || A Monthly Peer Reviewed & Referred Journal |

||Volume 9, Issue 8, August 2020||

Withania somnifera; Lantana indica; Aerva tomentosa; Salsola baryosoma; Suaeda maritime. Perennial herbs: Tephrosia hamiltonii; Tephrosia purpurea; Farsetia hamiltonii; Indigofera linnaei Ali.; Trianthema portulacastrum; Zaleya govindia; Borreria articularis; Echinopsechinatus; Launaea resedifolia; Launaea procumbens; Oligochaeta ramose; Pulicaria crispa; Catharanthus roseus; Convolvulus microphyllous; Datura metal; Solanum nigrum; Solanum surattense; Lepidagathis trinervis; Boerhavia diffusa; Achyranthes aspera; Amaranthus caudatus; Pupalia lappacea; Croton bonplandianum.; Euphorbia hirta. Annual herbs: Argemone mexicana; Fumaria indica; Sismbrium irio; Portulaca oleracea; Portulaca suffruticosa; Alysicarpus monilifer; Medicago laciniata , Melilotus indica; Fagonia cretica; Trigonella. polycerata; Trianthema triquetra; Acanthospermum hispidum; Artemisia scoparia; Gnaphalium indicum; Pulicaria angustifolia; Sonchus asper; Vernonia cinerea; Anagallis arvensis; Arnebia hispidissima; Heliotropium ellipticum; Heliotropium marifolium; Heliotropium subulatum; Datura innoxia; Leucas aspera; Gomphrena celosiodies; Indigofera cordifolia; Indigofera hochstetteri; Tephrosia strigosa; Ocimum canum; Chenopodium album; Chenopodium murale; Phyllanthus asperulatus. Ephemerals: Cleome gynandra; Cleome viscose; Polygala erioptera; Polygala irregularis; Indigofera astragalina; Polycarpaea corymbosa; Sida ovata; Corchorus tridens; Triumfetta pentandra; Tribulus terrestris; Cassia tora; Cassia occidentalis; Alysicarpus vaginalis; Indigofera linifolia; Indigofera sessiliflora; Gisekia pharnaceoides; Mollugo cerviana; Mollugo nudicaulis; Bidens biternata; Blainvilleaacmella; Trichodesma indicum; Evolvulus alsinoides; Physalis minima; Pedalium murex; Sesamum indicum; Martynia annua; Peristrophe bicalyculata;[4,5,6] Rostellularia procumbens; Anisomeles indica; Amaranthus spinosus; Digeramuricata; Euphorbia prostrata; Commelina benghalensis; Commelina forskalaei. Climbers and twiners: Cocculus pendulus; Celastrus paniculata; Tinospora cordifolia; Blastania fimbristipula; Citrulluscolocynthis; Cucumis callosus; Mukia maderaspatana; Pergularia daemia; Ipomoea eriocarpa; Ipomoea pes-tigridis. Grasses: Bulbostylis barbata; Cyperus arenarius; Cyperus bulbosus; Cyperus triceps; Aristida funiculata; Brachiariaramose; Brachiaria reptans; Cenchrus biflorus; Cenchrus ciliaris; Cenchrus pennisetiformis; Chloris virgata; Dactyloctenium sindicum; Vetiveria zizanioides; Typha elephantine; Eragrostis ciliaris; Eragrostispilosa; Eragrostis tremula; Saccharum bengalense. Production Systems and Biodiversity Thar is one of most heavily populated desert areas in the world and the main occupations of people living here are agriculture and animal husbandry. Agriculture is not a dependable proposition in this area—after the rainy season, at least 33% of crops fail. Animal husbandry, trees and grasses, intercropped with vegetables or fruit trees, is the most viable model for arid, drought-prone regions. The region faces frequent droughts. Overgrazing due to high animal populations, wind and water erosion, mining and other industries result in serious land degradation22. Agriculture: In past few decades the development of canals, tube wells etc. has changed crop pattern. Now the desert districts in Rajasthan have started producing rabi crops like wheat, mustard, cumin seed etc. The people have started to grow cash crops too. Pearl millet (Pennisetum typhoides) is the main monsoonal crop. The other common crops are Mong (Phaseolus radiates), Moth (Vigna aconitifolia), Guar (Cyamopsis tetragonoloba) and Til (Sesamum indicum). In the Indira Gandhi Nahar (canal) Project (IGNP) common areas, these traditional crops are being replaced by cash crops such as groundnut (Arachis hypogea), cotton (Gossypium spp.), rice (Oryza sativa), sugarcane (Saccharum officinarum), wheat (Triticum sativum) and barley (Hordeum vulgare) 15,29. This region is also the main opium producer and consumer area. During good rainfall years, vast areas in Jodhpur, Bikaner, Nagpur, Pali, Churu and Sri Ganganagar are being brought under cultivation. However, the irrigated area in the Thar is limited to 14% of the total crop area. Nearly 54% of the total irrigated area is fed by canals, 45% by wells and tube wells, and only about 1% by tanks16. However, with the development of IGNP the picture is changing29,30,46,52. Arrival of water in this region has opened up land for colonization in the Sri Ganganagar district and certain other parts of Rajasthan. The increase in population is due to immigration, especially in the Sri Ganganagar and Bikaner districts has taken place because of the newly irrigated areas and also higher population growth rates there. The IGNP has also brought tremendous changes in the crop pattern from subsistence farming to commercial farming29,30,43,45. A great extent of the marginal land has been brought under cultivation. In the canal-irrigated areas, the groundwater table is rising due to seepage from the canals, field channels and irrigated fields15. Moreover, owing to leakages in the channels and bad maintenance of the canals, in many places inter dune reservoirs have been formed where the vegetation cover has changed [2,3,4]from xerophytic and psammophytic to hydrophytic and mesophytic plants. Many wetlands are covered by aquatic vegetation such as Typha angustata, Arundo donax, Eichhornia crassipes, Imperata cylindrica, Phragmites and Saccharum spontaneum. The Government of India has started a centrally sponsored scheme under the title of Desert Development Program (DDP) based on watershed management with the objective to check spreading of desert and improve the living condition of people in desert. Livestock: Livestock production and agriculture are intrinsically linked, each being dependent on the other, and both crucial for overall food security. According to estimates of the Central Statistics Office (CSO), the value of output from livestock sector at current prices was about 4,59,051crore during 2011-12 which is about 24.8 per cent of the value of output from total agricultural and allied sector at current price and 25.6 percent at constant prices (2004-05). The value of output of milk was 3,05,484 crore in 2011-12, which is higher than the value of output of paddy and wheat. The value of output from meat group as per the estimates at current prices in 2011-12 was 83,641 crore. The value of output from eggs and wool group is 17,803 crore and 318 crore respectively for 2011-1224. In the last 15–20 years, the Rajasthan desert has seen

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122| || A Monthly Peer Reviewed & Referred Journal |

||Volume 9, Issue 8, August 2020||

many changes, including a manifold increase in animal population. Animal husbandry has become popular due to the difficult farming conditions. At present, there are ten times more animals per person in Rajasthan than the national average, and overgrazing is also a factor affecting climatic and drought conditions. A large number of farmers in Thar Desert depend on animal husbandry for their livelihood. Cow, buffalo, sheep, goats, camel, and ox consist of major cattle population. Buffalo are also found along the IGNP. Barmer district has the highest cattle population out of which sheep and goats are in majority. Some of the best breeds of bullocks such as Kankrej (Sanchori) and Nagauri are from desert region. This region[1,2] has one of the largest livestock densities in the world. Historically, the forage supply and demand scenario in this region indicates supply shortage of 62%, varying from a deficit of 30.9% in Zone IV to 71% in Zone III. Similar shortages were observed during the 1997–2003 field surveys due to an increase in the livestock numbers. The density of livestock varies from 42 in Jaisalmer district to 226 km2 in Sikar district16,44. Livestock density is directly proportional (positive correlation) to rainfall. This region is the biggest wool-producing area in India. Chokla, Marwari, Jaisalmeri, Magra, Malpuri, Sonadi, Nali and Pungal breeds of sheep are found in the region. Of the total wool production in India, 40-50% comes from Rajasthan. The sheep-wool from Rajasthan is considered best for carpet making industry in the world. The wool of Chokla breed of sheep is considered of superior quality. The breeding centers have been developed for Karakul and Merino sheep at Suratgarh, Jaitsar and Bikaner. Some important mills for making Woolen thread established in desert area are: Jodhpur Woolen Mill, Jodhpur; Rajasthan Woolen Mill, Bikaner and India Woolen Mill, Bikaner. Bikaner is the biggest mandi (market place) of wool in Asia. Most of the livestock are dependent on grazing on common lands in and around villages13,17,63. During famine years in the desert the nomadic Rebari people move with large herds of sheep and camel to the forest areas of south Rajasthan or nearby states like Madhya Pradesh for grazing the cattle. The importance of animal husbandry can be understood from the organization of large number of cattle fairs in the region. Cattle fairs are normally named after the folk-deities. Some of major cattle fairs held are Ramdevji cattle fair at Manasar in Nagaur district, Tejaji cattle fair at Parbatsar in Nagaur district, Baldeo cattle fair at Merta city in Nagaur district, Mallinath cattle fair at Tilwara in Barmer district. Agroforestry: Forestry has an important part to play in the amelioration of the conditions in semi-arid and arid lands. If properly planned, forestry can make an important contribution to the general welfare of the people living in desert areas. The living standard of the people in the desert is low. Many still cannot afford other fuels like gas, kerosene etc and fire wood constitute a major fuel. The forest area is mainly in southern districts of Rajasthan like Udaipur and Chittorgarh. The minimum forest area is in Churu district only 80 km2. Thus, the forest is insufficient to fulfill the needs of firewood and grazing in desert districts. This diverts the much needed cattle dung from the field [9,10,11]to the hearth. This in turn results into the decrease in agricultural production. Agroforestry model is best suited to the people of desert 2,51. The most important tree species in terms of providing a livelihood in this region is Prosopis cineraria. Prosopis cineraria provides wood of construction class. It is used for house-building, chiefly as rafters, posts scantlings, doors and windows, upright posts of Persian wheels, agricultural implements and shafts, spokes, fellows and yoke of carts. It can also be used for small turning work and tool-handles. Container manufacturing is another important wood-based industry, which depends heavily on desert-grown trees. It is a valuable fodder as well. The trees are heavily lopped particularly during winter months when no other green fodder is available in the dry tracts. There is a popular saying that death will not visit a man, even at the time of a famine, if he has a Prosopis cineraria, a goat and a camel, since the three together are somewhat said to sustain a man even under the most trying condition. The forage yield per tree varies a great deal. On an average, the yield of green forage from a full grown tree is expected to be about 60 kg with complete lopping having only the central leading shoot, 30 kg when the lower two third crown is lopped and 20 kg when the lower one third crown is lopped. The leaves (Loong) are of high nutritive value. Feeding of the leaves during winter when no other green fodder is generally available in rain-fed areas is thus profitable. The pods (Sangar or Sangri) have a sweetish pulp and are also used as fodder for all categories of livestock viz., cattle, sheep, goat and camel.

IV. CONCLUSION

Human well-being depends on biological diversity and ecosystems and the goods and services they provide. Unprecedented loss of biodiversity and degradation of ecosystems over the past few decades pose new and urgent challenges. Addressing these challenges necessitates the strengthening of existing models of biodiversity governance and formulating new ones. The strategic goals like preventing the extinction of endangered species, halving the loss of forests and natural habitats and also reclaim 15 per cent of degraded lands, move from conservation to restoration as well. The desert region is considered more sensitive to changing climate. A concerted effort is required to mainstream desert biodiversity and coordinate actions between all government sectors. The practices related to conservation, restoration and sustainable use with a blend of traditional knowledge and modern scientific interventions will lead to sustainable agriculture in the region. Some of the larger grasslands and Orans in this region should be put under multiple use protected areas alongwith traditional but controlled grazing and avoiding canal irrigation to these areas will be required for sustainable agriculture in future as well. The better deployment of agricultural biodiversity in this region will be essential to improve productivity, enhance ecosystem functions and adaptability.[11]

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122| || A Monthly Peer Reviewed & Referred Journal |

||Volume 9, Issue 8, August 2020||

REFERENCES

1. "PlanningCommission.NIC.in". Archived from the original on 14 April 2006. Retrieved 16 November 2009.
2. ^ OilIndia.NIC.in Archived 30 June 2006 at the Wayback Machine
3. ^ "Rajasthan or the Central and Western Rajpoot States, Volume 2, page 197-198". Higginbotham And Co. Madras. 14 August 2018.
4. ^ "Imperial Gazetter of India, Volume 21, page 272 - Imperial Gazetteer of India - Digital South Asia Library". Dsal.uchicago.edu. 18 February 2013. Retrieved 22 November 2013.
5. ^ "Bhatinda Government: District at A glance- Origin". Bhatinda Government. 14 August 2018. Archived from the original on 10 January 2011. Retrieved 14 August 2018.
6. ^ "Provincial Gazetteers Of India: Rajputana". Government of India. 14 August 2018.
7. ^ "Princely States of India".
8. ^ "Provincial Gazetteers Of India: Rajputana". Government of India. 14 August 2018.
9. ^ Hasan, Arif; Raza, Mansoor (2009). Migration and Small Towns in Pakistan. IIED. pp. 15–16. ISBN 9781843697343.
10. ^ Maini, Tridivesh Singh (15 August 2012). "Not just another border". Himal South Asian.
11. ^ Arisar, Allah Bux (6 October 2015). "Families separated by Pak-India border yearn to see their loved ones". News Lens Pakistan. Archived from the original on 25 December 2016. Retrieved 25 December 2016.