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ICAR-CAZRI

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From the Desk of Co-ordinator

Livestock plays a crucial role in providing life support to desertic farmers depending largely on subsistence agriculture. This issue of Desert Environment Newsletter therefore, focuses on livestock and related issues. The farmlands and homesteads in arid areas also have a variety of rodents as pests and hence their vivid description finds a place in this issue. Technologies on improving livestock productivity bring in it a detailed update on a large array of options available for different end users. Immense contribution of Central Sheep and Wool Research Institute, Avikanagar, a premier institution working on all issues related to sheep and wool will interest you. Population trends of cattle, sheep, goat, buffalo and camel from 1956 to 2012 in the "Knowledge Corner" indicate increasing trends. Surprisingly, there is as yet no national grazing policy, a draft one does exist. This highlights the importance of having such a policy at the earliest.

Hope this issue interests you all.

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Know Your Desert

RODENTS OF ARID REGION

Rodents (Order: Rodentia; Class: Mammalia) comprise practically over 40% of the known living mammals of the world. They are one of the most successful groups of animals on the earth due to their vast breeding potential and easy adaptability to a wide variety of habitats. In India the Order Rodentia is represented by 101 species.

Rodents exhibit a great diversity in respect to their choice of habitats in hot arid regions which is evident from the occurrence of 20 rodent species belonging to 13 genera and 3 families. Two families viz., Hystricidae (*Hystrix indica*) and Sciuridae (*Funambulus pennanti*) are represented by one species each, whereas family Muridae with two sub families, viz, Gerbillinae (gerbils) and Murinae (rats, mice, bandicoots etc) are represented by four and 14 species respectively. An analysis of faunistic diversity of rodent in arid zone reveals that the region has an admixture of Saharan and Oriental fauna. Of the 20 species, two are commensal and others are field or wild rodents. The rodent species of the arid region are detailed as under:

1. *Hystrix indica* : (Indian crested porcupine, Family: Hystricidae): This largest rodent species in India has distinct long, stiff, bristle-like hairs called quills on the neck and upper back (Fig. 1). The body is clothed with alternating dark brown and white quills and the tail is covered by short and broad quills. *Hystrix indica,* occurs throughout the Indian subcontinent from valleys up to 2750 m preferring forest plantations, rocky hillsides or sandy deserts, ravines and valleys. Porcupines are nocturnal with an acute sense of smell and breed throughout the year with a litter size ranging 1-4.

Fig.1: Indian crested porcupine *Hystrix indica*

Fig.2 : Northern Palm squirrel *Funambulus pennanti*

2. *Funambulus pennanti* (Northern palm squirrel, Family: Sciuridae): This medium sized rodent has a bushy tail. The dorsal side is greyish brown with five distinctly white stripes separated by four off white bands (Fig. 2). It is diurnal and nests in holes in tree trunks and crevices in the walls of buildings, windowsills and compounds. It breeds round the year with peaks during March–April and July-September in Rajasthan with a litter size of 1-5.

3. *Tatera indica* (Indian gerbil, Family: Muridae, Subfamily: Gerbilliane): It is a medium sized rodent. Its tail is covered with hair, which terminates at the tip as a tuft, a characteristic feature of all gerbils (Fig. 3). The hind feet are longer than fore feet. It is a nocturnal occurring on open plains, loose sandy soils of the desert and is usually found at the edges of cultivation. Burrows are dug near hedges, thickets or under bushes, sometimes inside the field also when conditions are dry. *T. indica* breeds throughout the year in arid Rajasthan with maximum littering in the month of August and a minor peak in February with a litter size of 1-9.

Fig.3: Indian Gerbil, *Tatera indica*

Fig.4: Indian desert gerbil, *Meriones hurrinae*

4. *Meriones hurrianae* (Indian desert gerbil, Family: Muridae, Sub family: Gerbillinae): A true desertic fauna, this is restricted to arid tracts of Rajasthan and adjoining regions of Haryana, Punjab and north-east Gujarat. The species is well adapted to survive the extremes of arid climates. Its body colour is sandy grey to brownish grey dorsally and white to off-white ventrally (Fig. 4). Tail is pale with dark brown tussle of hair at the tip. These gerbils are diurnal and inhabit crop fields, grasslands, waste lands, thorny forests, etc. Females breed throughout the year with two peaks in February and July but a third peak is also observed during September-November with a litter size of 1-9.

5. *Gerbillus* species (Family: Muridae, Sub family: Gerbillinae): Two species of *Gerbillus* viz., *G. gleadowii* and *G. nanus* indus occur in Indian arid region and both are true xeric fauna and therefore occur only in extreme desertic tracts in Jaisalmer, Jodhpur, Barmer, Bikaner, Churu, Sikar and Jhunjhunu districts in Rajasthan (Fig. 5). These are small sized rodents and inhabit duny, hummocky or interdunal plains in sandy habitats. Both the species have two peak breeding seasons in a year i.e. winter and summer months. The litter size is 2-5 (in summer) and 5-6 (in winter) for *G. gleadowi* and 2-3 for *G. nanus.*

Fig.5: Hairy footed gerbil *Gerbillus gleadowii*

Fig.6: Short tailed mole rat *Nisokia indica*

6. *Nesokia indica* (Family: Muridae Sub family: Murinae): This species is relatively large sized with heavily built body (Fig. 6), which is grayish brown on the dorsum and has a lighter ventral side. Very short tail of the animal and soil mole hills present near its burrow openings gives it the common name as short tailed mole rat. It prefers bunds in cultivated fields along water channels but also occurs in natural vegetation. It is a very shy rodent with nocturnal and fossorial habits. Breeding occurs mainly during winters with a litter size of 1-6.

***7. Millardia meltada* (Soft furred field rat, Family: Muridae, Sub family: Murinae):** This species is a medium sized rodent has soft fur, light to dark grey dorsally with foot and belly being off white. Tail is naked with annular rings similar to body colour with dark grey above and pale below. It is distributed throughout Rajasthan in irrigated crop fields, scrub grassland, sandy plains. It breeds throughout the year with peak reproduction occurring in monsoon and spring season. Litter size 1-10.

8. *Millardia gleadowi* (Family Muridae, Subfamily Murinae): It is a small sized rodent reported from northwest India and is commonly referred as sand coloured metad. The body is sand brown in colour above and white below. It is a nocturnal species and lives in burrows. Prefers dry and sandy areas away from irrigated fields. It breeds from August to October.

9. *Golunda ellioti* (Family Muridae, Subfamily Murinae): This small sized rodent, commonly known as Indian bush rat, is diurnal in habit. Body covered with soft fur is yellowish brown speckled with black dorsum and dull white at the ventral side. The species is distributed throughout India including north-west arid zones of Rajasthan, Punjab and Gujarat. It makes burrows in scrub, thorny and bushy plantations and around crop fields.

10. *Bandicota bengalensis*(Family Muridae, Subfamily Murinae): Commonly known as the lesser bandicoot rat, it is a robust rodent with a round head and a broad muzzle (Fig. 7). The body is covered with coarse fur, which forms black-tipped piles on the dorsal side. Tail comparatively shorter. Being a mesic species it was not reported in extreme desert regions. It is reported in irrigated croplands and in urban locales of Jodhpur and Bikaner cities. It is a fossorial rodent and burrows are elaborate with several openings characteristically covered with a heap of dug out soil. Breeding occurs throughout the year with litter size, 1-11.

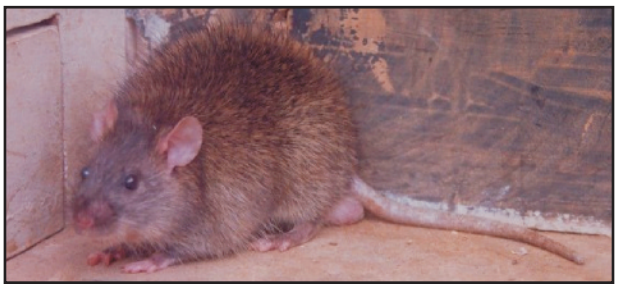

Fig.7: Mole rat *Bandicoota bengalensis*

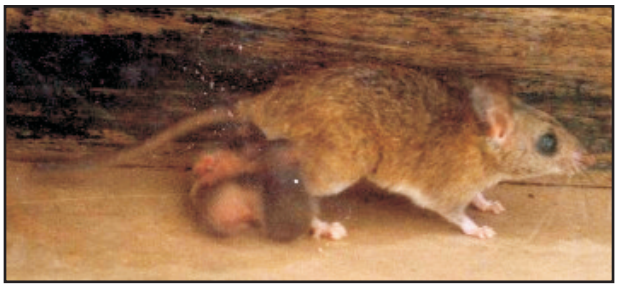

Fig.8: Cutch rock rat *Rattus cutchicus*

11. Cremnomys cutchicus Fig. 8 (Family Muridae, Subfamily Murinae): It is commonly referred as cutch rock rat and is an endemic rodent species in India extending north up to Rajasthan and Bihar. The animals are medium sized with long tail and soft body fur. These rats have grey to brown dorsum and dull greyish ventrum. It is a nocturnal rodent and prefers the rocky habitats, where it lives in cracks and crevices. Not much is known about its biology; however the species registers population peaks from March to May and August to October in arid regions.

12. *Vandeleuria oleracea* (Family Muridae, Subfamily Murinae): It is a small sized arboreal rodent with a very long unicoloured tail therefore called as Indian long tailed tree mouse (Fig. 9). Dorsum is dull to dusky or sand coloured with white ventrum.. It is widely distributed species in India. It makes globular nests in the hollow of trees. Also nests in thatched roofs or in baya's nests.

Fig.9: Tree mouse *Vandeleuria oleracea*

Fig.10: Indian Field Mice *Mus booduga*

13. *Mus booduga* (Family Muridae, Sub family Murinae): It is a tiny mouse weighing 10-12g. Dorsal fur on the body including tail varies in colour from pale sandy or dark brown to greyish and the ventral side is pure white, thus the tail looks bicoloured (Fig. 10). The mouse is commonly known as Indian field mouse. It is a ruderal species and occurs in and around irrigated crop fields throughout India. It breeds throughout the year except during very cold months.

14. *Mus* species (Family Muridae, Sub family Murinae): Besides, *Mus booduga,* four other *Mus* species have also been reported from fields in arid region. They are *M. platythrix, M. cervicolor; M. phillipsi* and *M. saxicola sadhu.* All these species are nocturnal and make simple burrows in sandy, rocky and gravelly habitats. *Rattus rattus* (Fig.11) and *Mus musculus* (Fig.12) also occur in arid regions.

Fig.11: House rat, *Rattus rattus*

Fig.12: House mouse, *Mus musculus*

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Know Your Desert Plants

Maytenus emerginata

Maytenus emarginata (Willd.) belonging to the family Celastraceae and popularly known as"kankero/kankari", is an evergreen tree. The species is globally distributed in Paleotropics. Within India, it is common in dry scrub forests throughout, particularly on poor soils in Central and Western peninsular India. It is found throughout in India (Madhya Pradesh, Uttar Pradesh, Punjab, Maharashtra, Gujarat, Delhi, Bihar, Tamilnadu and Rajasthan)

This is a tall shrub or a small, compact tree (Fig.13) Branches are often spiny,with purple leaves and white flowers which are small in axillary cymes. The leaves are coriaceous glabrous, variable obovate and decurrent at the base, 3.5-14.5 x 2-9 cm. Petioles are 2-12 mm long, nerves 5-6 pairs. Petals are oblongor ovate oblong, 2-3 x 1 mm. Stamens which are 2-3 mm long, inserted beneath the margin of the disc. Ovaryis glabrous and is partially immersed.Its capsules are globose, 10-12 x 8-9 mm, bivalve and reddish purple.

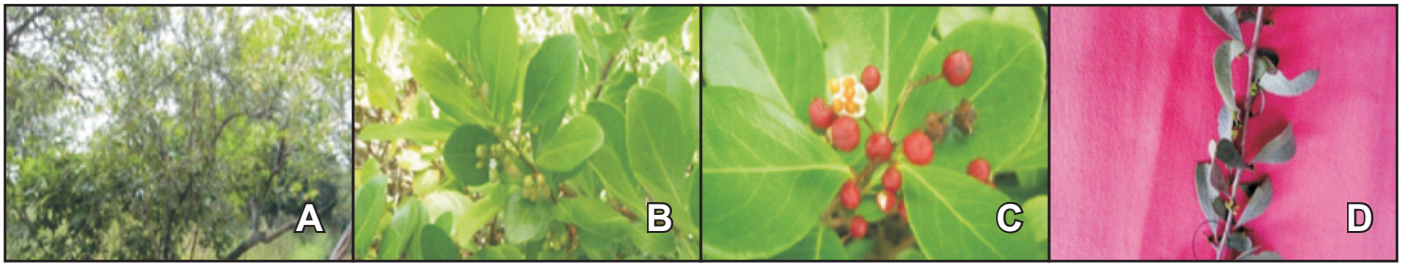

Fig.13 : *Maytenus emerginata* : A. Plant in Natural condition, B. Fruting Plant, C. Close up of flower, D. Twig with spike (encircled).

ECONOMIC IMPORTANCE :

This plant is valuable biomass producer in the Aravallis and the Indian desert. The plant provides fodder, timber and fuel wood. It has medicinal value. The plant is economically and ecologically important.

PROPAGATION :

It prefers gravelly shallow to sandy loam soils in plains and pediments. *Maytenus emarginata* is an out breeding tree therefore it shows great variability. The seed raised plants show enormous variability and if selected plants are to be propagated they need to be vegetatively propagated or cloned through tissue culture methods. The conventional methods of vegetative propagation are not known for this plant species. Therefore for large scale multiplication of selected clones tissue culture method is developed. Seeds are sown under glass in autumn.

MEDICINAL IMPORTANCE :

The root is used in gastero-intestinal troubles especially to cure dysentery. Pulverized leaves are given in milk to children as a vermifuge. A decoction of the leafy twigs is used as a mouth wash to relieve toothache. The extract of plant shows cytotoxic effect on some cancers. The plant is reported to possess antiplasmodic properties. The bark is ground to a paste and applied with mustard oil to kill lice in the hair. It provides fodder, timber and fuel.

PHARMACOLOGY

Pharmacological studies on *Maytenus emarginata* revealed that it contains cytotoxic sesquiterpene pyridine alkaloid emarginatine A, B, E, F, G and emarginatinine which showed significant antitumor properties.

- Shweta Mathur
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Technological Solutions to Combat Desertification

STRATEGIES FOR IMPROVING THE LIVESTOCK PRODUCTIVITY IN DRYLANDS

India has a total geographical area of 328.2 mha with drylands covering 228.3 mha (69.6%) of the total land area. The drylands are characterised by low rainfall and high evaporation, resulting in lack of water and limited soil fertility, limiting agriculture to a single rainfed crop. Livestock production has emerged as the main activity that sustains livelihoods in these low productivity and unstable environments. The farming systems are quite diverse with a variety of crops and cropping systems, agroforestry and livestock production. Livestock production in drylands is considered an instrument to socio-economic change to improved income and quality of life with equity. The potential of livestock to reduce poverty is enormous, as they contribute to the livelihoods of 19 million people, of which women constitute 71 percent of the labour force.

Traditionally, the dryland farmers have integrated their livestock with crop production. The livestock production systems are complex and based on traditional and socio-economic considerations, mainly guided by available feed resources. These traditional production systems are designed to be self-sufficient at the household level and are dependent on the low-cost agro-by-products as nutritional input to animals. The prevalent livestock production systems of drylands of India can broadly be classified into (i) Small holder mixed crop-livestock production (ii) Nomadism/Pastoralism and (iii) Commercial livestock production system:

The availability of improved genotypes and feeds and nutrition are the two major constraints in this sector. The main reasons for low productivity of livestock in drylands are: (i) poor exploitation of genetic potential of indigenous animals (ii)inadequate feed and fodder resources (iii) insufficient health cover, poor extension services and linkages with associated departments (iv) low adoption of available technologies and (v)weak institutional and policy support- inadequate marketing and credit support. An understanding of the production factors (livestock, capital, feed, land and labour) and processes (description, diagnosis, technology design, testing and extension) affecting livestock production is a pre-requisite for enhancing livestock productivity in drylands. The following strategies of livestock production may be implemented for sustainable development of drylands.

i. Increasing forage availability: Fodder production in drylands can be increased by promoting low water requiring and short duration forages (cluster bean, cowpea etc.) intercropped with long duration crops such as sorghum, pearl millet in areas receiving less than 400 mm annual rainfall. The improved cultivars of dual purpose crops like pearl millet, sorghum, barley and some legumes can be grown for food as well as fodder in areas having assured irrigation facilities. CAZRI has developed suitable cropping sequences for round the year fodder production for arid regions. Bajra+ cowpea- oat- Sorghum cropping sequence provides maximum green fodder yield (90.2 t/ha/year) followed by cowpea-oat-bajra sequence (82.3 t/ha/year) under limited irrigation. Fodder mixtures like maize cowpea bajra, cowpea or chari +cowpea can be practiced during kharif season for maximisation of fodder production. Similarly, during winter season, short duration fodder like turnips and *Brassica* species can be grown for forage.

Fig.14 : *P. cineraria* based silvi-pasture system

Different agroforestry systems such as agri-silviculture, silvi-pasture, agri-silvipasture horti-pasture, agri –horti-silvi-pasture etc with livestock are useful for dryland farming (Fig.14). Silvi-pastoral model for marginal and small farmers involving pasture grasses (*Cenchrus ciliaris, Lasiurus sindicus*) in association with fodder trees (*H. binata and C. mopane*) and legumes (*Cowpea, Lablab purpurieus*) have been developed for higher productivity for sustainable livestock production for arid regions of Rajasthan. *Cenchrus* sp. amongst grasses, *Stylosanthis hamata* amongst range legumes and *Leucaena leucocephala* and *Sesbania sesban* as shrubs and trees have great potential to increase forage resources from the degraded lands in semi-arid zone of India.

ii. Exploitation of unconventional feed resources: Dryland areas have many unconventional feed resources, hence, efforts should be made to identify and utilize un-conventional feed resources on a continuous basis to increases feed resource base. The studies at CAZRI revealed that tumba (*Citrullus colocynthis*) seed cake and lana (*Haloxylon salicornicum*) grains are nutritionally rich source of protein and can be included up to 25 % in the concentrate feed. A balanced concentrate mixture can be prepared by mixing the locally available feed ingredients, including *Prosopis juliflora pods, C. colocynthis* seed cake and mineral mixture. Powder of *P. juliflora* pods mixed up to 35% in the concentrate increased the milk production of goats. *P. juliflora* pod husk can also be used up to 50 percent level in the concentrate along with tumba seed cake in the ration of sheep without any adverse effect on animal health. Thornless Cactus (*Opuntia ficus indica*) can be fed to livestock as a source of green fodder during lean months. Animal feeding trials indicated good acceptability and palatability both by small ruminants and cattle. The 33% of *Opuntia* leaves can be safely introduced in total mixed ration of small ruminants in arid regions.

iii. Enhancing feed utilization: Innovative feeding practices are necessary that can sustain all-year-round feeding in more intensive systems of production. These could include the chopping, urea treatment, supplementation, use of multi-nutrient block, etc.

iv. Chopping of fodder: By using chaff cutter wastage of the fodder could be reduced up to 30% and feeding of chopped roughage helps in adopting strategic supplementation, improves palatability of less preferred roughages by mixing with highly palatable fodder and improves digestibility and the net biological value of the feed.

v. Urea treatment of low-grade roughages: Nutritional value and palatability of poor quality herbage could be improved through urea treatment. Four percent urea, 50 liters water per 100 kg straw/ herbage and 15 to 21 days incubation period are optimum for treatment. Urea treatment, apart from being a source of nitrogen for microbial synthesis, also provides additional energy due to the weakening/loosening of the lingo-cellulose bonds in the treated straw. Treatment improves dry matter intake by 7 to 10 units and digestibility by 4 to 15 units.

vi. Strategic supplementation: Appropriate formulations and technologies for production of multi-nutrient blocks (MNB), multi-nutrient mixture (MNM), and complete and supplemental fodder blocks using locally available feed resources were developed and evaluated at CAZRI. The MNB offered @ 250 g/head/day increased average daily milk yield of cows and buffalo to the tune of 7.70 and 5.80 per cent, respectively with B:C ratio of 4.95 in buffaloes and 4.29 in cows. Likewise the daily milk yield of goats increased to17.6% with B;C ratio of 3.41. Supplementation of feed blocks and nutrient mixture increased daily milk yield (20-25%) in cattle and buffaloes maintained under grazing conditions. The MNB supplementation also improves reproductive performance of livestock due to enhanced availability and utilization of nutrients, particularly the micronutrients (Fig.15).

Fig.15 : Balanced ration to cattle

vii. Shelter management to alleviate the thermal stress: Three types of shelters for livestock viz; open housing system (Barbed enclosure without any roof), Kutcha (Thatched roof house) and Pucca housing system are used by dryland farmers. Improved animal shelter model with east-west orientation was developed by CAZRI which provided comfortable micro-climate to the animals during extreme weather conditions and consequently increased milk production.

viii. Health management: Livestock diseases seriously reduce productivity and also cause major economic losses. There are certain diseases, which are more common in drylands, and need greater attention so as to prevent its outbreak. There is a need to properly follow the schedule of Foot and Mouth Disease vaccination at least twice in a year, yearly pre-monsoon vaccination for Black Quarter for cattle and buffaloes. Haemorrhagic Septicaemia vaccinations need to be extended to camels beside cattle and buffaloes, Antharax vaccination also need be provided to sheep, buffalo and camel beside cattle and Enterotoxaemia and Sheep pox vaccination need be extended to goats in addition to sheep with routine schedule (Fig.16).

Fig.16 : On farm veterinary aid

ix. Policy and support services: For small holder livestock producers, credit is most critical input, as they require cash for day-to-day management of their household enterprise. Credit facilities enable the subsistence farmers' access to technologies so as to become viable farmers. No institutional mechanism exists in the dryland areas for giving them cash/micro credit. It is therefore, suggested that Kisan credit card should include credit for crop as well as livestock production inputs. Creation of conducive environment and providing policy and technical support is needed to facilitate the emergence of private extension and service providers in areas where sufficient demand exists. A village based livestock service delivery mechanism i.e., community driven needs to be promoted because timely availability of vaccination and deworming could reduce production losses, drastically cut down mortality of livestock, increase output, protect farmers investment and will help to appreciably increase households income. Village service providers should equip themselves with mobility and communication facilities. Extension approach should be need-based with problem-solving dimensions and participatory in nature. Encouraging farmers trainings to improve their skills in efficient and sustainable livestock production and management. This will act as the harbinger of change and technology adoption in drylands.

-A K Misra

Conferences

DATE	TOPIC	PLACE
July 28 - 29, 2015	5th Kubuqi International Desert Forum	Ordos City, Inner Mongolia, China
August 11-12, 2015	International Conference on Livestock Nutrition	Frankfurt, Germany
September 15 -17, 2015	4th International Conference on Applied Life Sciences (ICALS 2015)	Mumbai, India

Know Your Institutions

ICAR-Central Sheep and Wool Research Institute, Avikanagar

Fig.17 : CSWRI-Avikanagar

The ICAR - Central Sheep and Wool Research Institute is a premier Institute (Fig.17) of Indian Council of Agricultural Research engaged in research, education and extension activities for enhancing the productivity of sheep by applying scientific methods and newly developed technologies on sheep and wool (Fig.18). It was established in 1962 at Malpura in Rajasthan, the campus is now known as Avikanagar. The campus is spread over an area of 1510 ha. It is located in the hot semi-arid region of India, (75°28 E and 26°17 N, altitude of 320 m amsl). It has three Regional Research Centres in different climatic zones of the country to develop region specific technologies-(I) North Temperate Regional Station (NTRS) in temperate region at Garsa, Kullu in Himachal Pradesh, (II) Southern Regional Research Centre (SRRC) in sub temperate region at Mannavanur in Tamil Nadu and (III) Arid Research Centre (ARC) at Bikaner in the arid region of Rajasthan.

Following are highlights of research achievements:

Feed and fodder development and utilization

Fig.18 : Herd of Sheeps on experimental farm

Institute is propagating opuntia as an alternative feed for animals during scarcity period. Prickly pear cactus is a fast growing xerophyte, draught resistant and well-adopted to hot arid environment. Opuntia contained 12% dry matter, 10.5% crude protein, 57.2% NDF, 25.9% ADF, 2.4% ADL and 3.9 Mcal/kg. With enough water content (88%), requirement of water can easily be met through fresh opuntia feeding. Water requirement of around 1 litre is met through feeding of 1.20 kg of fresh opuntia without any adverse effect on nutrient intake and utilization. Herbage available abundantly after monsoonal rains in arid and semiarid regions can be easily conserved in form of silage and fed to sheep during scarcity period in desert areas. Polypropylene silage bags helped to meet the growing shortage of animal fodder. Fodder can be easily stored in bags up to 1 year without deterioration of nutritious value. Being a lighter material, transportation is easy. The bags are readily available. One bag of 25-30 kg capacity is sufficient for a small flock of sheep. Another method of feed blocks from roughage and concentrate for supplementing during scarcity period has been developed particularly during feed scarcity in drought and famine in desert areas. Complete feed blocks from roughage, concentrate, along with molasses, minerals, urea and salt have been developed for feeding during scarcity period. Bulky feeds can be converted into blocks by compressing. Feed blocks are easy to store, transport and can be stored up to 2 years in dry weather. This increased intake by 15-25% and reduce 30-35% of wastages. CFB reduce bulk density by 33%. Methane emission from animals and its contribution to global warming is burning issue in recent years. Some work on balancing of ration of animals has been taken up in the Institute for reducing methane emission. Certain feeds and herbs have been identified that play an important role in reducing methane emission. Mineral deficiency in animals is an area specific problem and causes severe economic losses to farmers in term of reduced production and reproduction of animals. Area specific mineral mixture for sheep and goats of semiarid Rajasthan has been developed for

improving health, reproduction and production. Mineral mixture pellets of 5 g incorporating required minerals concentration were prepared with molasses (1%) as binder. The supplementation of pellet mineral mixture to sheep increased wool yield by 8-9%, milk yield by 10-15% and bring 60% of sheep into estrus. Supplementation of mineral mixture at 2% of feed reduces cases of urinary calculi, stomatitis and wool shedding. Poor milk yield of sheep compromise the growth of lambs and also survivability. Major tolls of mortality in lambs took place during early life because of poor milk yield of mother. A low cost reconstituted milk formulation has been developed. It consists of 22-24 % crude protein, 30 - 32 % crude fat, 22-25 % lactose and 5 - 10 % minerals. The formulation is available in powder form and can be mixed with warm water at the time of feeding and fed to lambs at the rate of 10 % of body weight in 3-4 feeding in a day. Malpura lambs attained 19% more body weight at 90 days of age by supplementing reconstituted milk at the rate of 200 ml daily.

Establishment of pasture at sloppy lands in desert areas

Institute has developed technologies for establishing pasture and silvipasture on sandy loam soil. *Cenchrus* sown in line across the slope along with V-ditch contour bunding in sloppy degraded land reduce the soil erosion through wind as well as through run-off water. Vegetative barrier plant across the slope reduces the run-off velocity and improves soil moisture retention. Fodder trees viz. *Ailanthus excelsa* (Ardu) , *Azardirachta indica* (Neem) anchor the soil and breaks wind that increase the moisture losses and wind erosion or shifting of loose soil particles. Minor and major check dams are created at different sloppy sites for storage and safe dispose of surplus run-off water to harvesting pits. At higher slope sites (> 20 %), bench terracing was found quite effective to cover the soil with vegetation (grasses and fodder crops). Incorporation of legumes (annual and perennial) improves soil condition and fodder quality (Fig.19).

Fig.19 : Fodder tree, crop and grass cultivation on sloppy lands

Sheep resource improvement

Institute maintains large number of sheep breeds. Native sheep breeds of desert like Marwari, Chokla and Magra have been improved through selection and pure breeds are made available to farmers on reasonable price for genetic improvement of their sheep. Magra sheep in desert areas is one of the excellent lustrous wool producing sheep. A field unit of Magra sheep at ARC, Bikaner is working with farmers of Bikaner district. Elite rams were distributed to registered farmers and performance of progenies born is being recorded. Marwari a hardy and sturdy sheep breed of desert has great demand in arid region for wool production. Chokla sheep is another carpet breed of desert region. Chokla yields 2.2 - 2.4 kg carpet wool but the population of Chokla sheep is declining rapidly. A programme has been taken up by ARC Bikaner with NBAGR, Karnal for conservation of breed in the region. Chokla sheep are also made available to farmers from ARC, Bikaner centre at reasonable price. Mutton demand in the country is growing rapidly and animals from desert districts of Rajasthan are being regularly sold to Metro cities. Institute has developed a prolific sheep for enhancing mutton production. The introgression of FecB gene in Malpura and development of three breed cross (Garole x Malpura x Patanwadi) provide 40 % more lamb per ewe per year and increase the meat production by 20-25%. This breed of sheep will be boon for farmers.

Institute training and demonstration programme

Institute extends training facilities to Field veterinarians, technocrats, academicians and extension personnel in recent advances in sheep production and health. Institute has special programme for women empowerment (Fig.20) and artisan capacity building in woollen and handicraft products. The Institute provides consultancy services and regularly organizes training programmes for the benefit of user groups. Institute provides breeding rams on book value at nominal cost for genetic improvement of flock, AI facilities, disease diagnosis and vaccination, drenching and dipping, wool testing etc.

Fig. 20 : Women Empowerment Programme

Institute is working with farmers and demonstrating technologies in Rajasthan, Tamil Nadu, Himachal Pradesh under institute programme and supply elite germplasm to farmers through network and Mega sheep seed projects in the state of Rajasthan, Maharastra, UP, Andhra Pradesh, Tamil Nadu, Jharkhand, Karnataka. The technologies developed in the institute are being demonstrated in farmer's field, Kisan Mela in the institute and exhibitions in other places are being organised. Kisan gosthi, Field days, Health camps etc. are arranged regularly to create awareness among farmers about newer technologies. SMS alert service to farmers has been initiated where farmers receive alert message about management and health practics. Institute scientists are linked to Kisan Call Centre where all queries of farmers are being addressed. Institute has developed films / videos on institute activities and on important technologies for easy transfer to farmers. These films are shown to farmers in exhibition and villages. Publication of folders / brochures for farmers and their distribution for implementation of newer technologies and knowledge are regular features.

Director- CSWRI

विश्व जैव विविधता दिवस आज : मरुस्थल की कई प्रजातियां खतरे में, हिमालयी क्षेत्र से नए पौधों व जंतुओं का आगमन

थार में मैदानी जीवों की घुसपैठ

Patrika, Jodhpur 22 May, 2015

Know Policies and Programmes Related to Combating Desertification

National Grazing and Grassland Policy

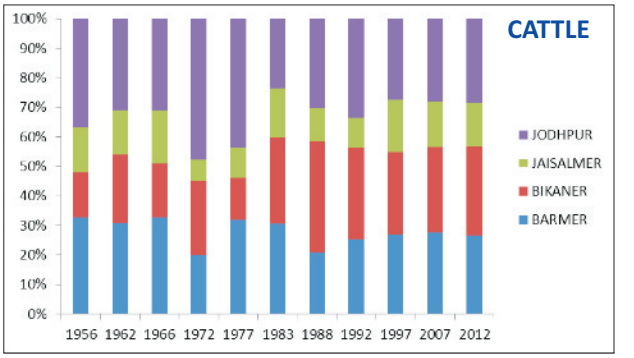
Despite the fact that India has one of the largest livestock populations in the world, with an estimated 520 million heads, we do not have a grazing or grassland policy on ground. Though the Government of India has formulated 'Draft Grazing and Livestock Management Policy (1994)', and 'Draft National Policy for Common Property Resource Lands (CPRLs)', these policies have not been implemented effectively in the field. There is no sound management plan for the development of pasture land and protection of existing grasslands. We have not even fully documented the value of these grasslands in terms of their biological diversity. The famous Sewan grasslands of Jaisalmer and Bikaner, and the Banni grassland of Kutch have been neglected, resulting in over-grazing, spread of invasive species such as *Prosopis chilensis* and conversion to agricultural crops with dubious results. The highly productive wet terai grasslands of the Gangetic and Brahmaputra floodplains are underrepresented in protected area network of India, except some areas such as Kaziranga, Dudhwa, Jaldapara national parks. The importance of rotational or seasonal grazing, some control on free ranging animals, total protection of selected grassland plots to serve as nucleus for seed bank, secure tenure for pastoralists (both resident and nomadic) over pastures, and genetic improvement of livestock (using indigenous breeds, not exotics ones) have not been taken into consideration in animal husbandry programmes of the country. In our country, only livestock is considered as wealth, not the grasslands on which this livestock depends, nor the traditional knowledge that helps maintain this livestock. Interestingly, protection of fodder producing, natural grasslands greatly help in the protection of many endangered species. For example, in Maharashtra, in the late 1970s, a large number of plantation and grassland plots were developed under the Drought-Prone-Areas-Programme (DPAP). The main aim of DPAP was to take conservation measures for the protection of over-used land which was suffering from severe overgrazing and soil erosion. The DPAP not only helped in achieving its aim in certain areas but it also resulted in restoration of wildlife, especially the Great Indian Bustard, Blackbuck and Grey Wolf. Grasslands are not managed as an ecosystem in their own right by the Forest Department whose interest lies mainly in trees, not by the Agriculture Department who are interested in agriculture crops, nor the Veterinary Department who are concerned with livestock, but not the grass on which the livestock depends. Grasslands are the 'common' lands of the community and while there have been robust traditional institutions ensuring their sustainable management in the past, today due to take-over by government or breakdown of traditional institutions they are the responsibility of none. They are the most productive ecosystems in the Indian subcontinent, but they belong to all, are controlled by none, and they have no godfathers. Indeed they are often looked at as 'wastelands' on which tree plantations have to be done, or which can be easily diverted for other uses. The Forest Policy of 1894 was the most elaborate of all the policies in explaining the modalities of grazing in protected forests. The Forest Policy of 1954 was extremely critical of unrestricted and uncontrolled grazing and refuted it as contrary to scientific management of forests. However, it also admitted that in some forest/grassland types, limited grazing does not do much harm, and may actually improve the grassland/forests. Dhebar Commission (Schedule Areas and Schedule Tribes Commission, 1966) recommended that the Forest Department should promote growth of improved varieties of grasses in forest areas and grazing fees should be regulated. The National Commission on Agriculture (NCA) (1976) recommended strict control on grazing and regulation on grazing. It also recommended that grazing by goats in forest should be prohibited and sheep allowed only in specially marked grasslands under strict rotational control. The NCA also recommended the promulgation of grazing rules by each state specifying the grazing rates and providing for the manner in which grazing should be permitted.

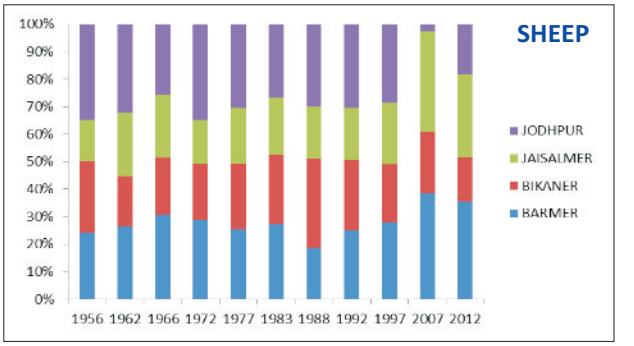
-Compiled by Ritu Purohit
ICAR-CAZRI, Jodhpur

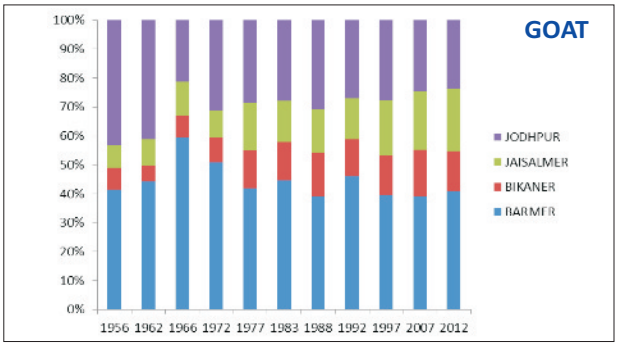
Knowledge Corner

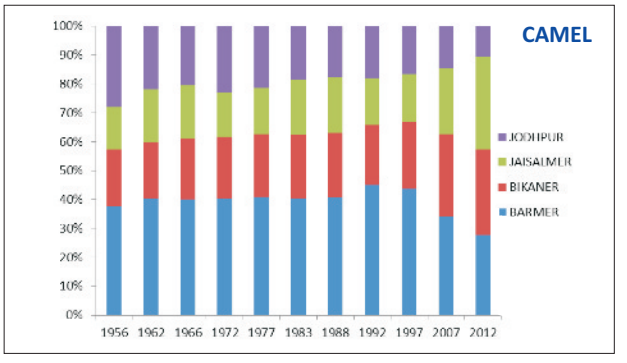
Livestock Population Trend

In view of life support ability and economic value, almost all household in arid zone have livestock herds of different sizes. While the herd size has increased with time to meet the financial needs it has also become the source and cause of degradation of natural vegetation by way of over grazing and over stocking. It is important to underpin the fact that area available for grazing has more or less remained same or in fact declined during past 50 years by way of diverting it to urbanisation, industrialization, mining and other such activities while the livestock has shown a constant increasing trend. We present below the scenario of livestock number from the year 1956-2012 that clearly shows how many times pressure of livestock has increased in the past 60 years (Fig. 21). This calls for an urgent action because grazing resources are limited. Land area is not going to increase thus putting the area of grazable land under severe stress because these continuously declining grazing lands have to support increasingly more livestock. Consequently grazing lands have already started showing severe to very severe desertification. Studies at CAZRI in all 12 districts of western Rajasthan also support this fact because 2/3 of all grazing lands are very severely degraded while 13-15% are severely degraded ,only 4-5 % are moderately degraded and 1-2 % are in good condition. The situation is further accentuated by migration of livestock that further degrades even crop lands. All these issues deserve attention of policy makers, researchers and NGO's .









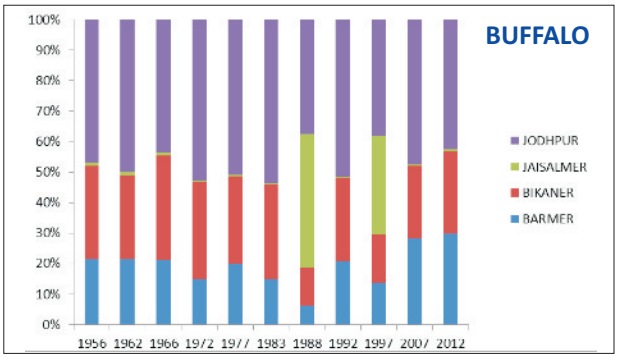


Fig. 21: Livestock Population Trends in four districts

-Compiled by
Suresh Kumar & Shweta Mathur
ICAR-CAZRI, Jodhpur

Events By ENVIS CAZRI

काजरी व आफरी में संगोष्ठी

जोधपुर@पत्रिका. विश्व पर्यावरण दिवस के मौके पर केंद्रीय शुष्क क्षेत्र अनुसंधान संस्थान (काजरी) और शुष्क वन अनुसंधान संस्थान (आफरी) में संगोष्ठी का आयोजन किया गया, जिसमें पर्यावरण संरक्षण और उसके बचाव को लेकर जागरुकता का आह्वान किया गया।

काजरी में आयोजित संगोष्ठी में प्रभारी निदेशक डॉ. आरके भट्ट ने कहा कि जलवायु में परिवर्तन हो रहा है तथा बदलाव प्रकृति का नियम है, लेकिन प्रकृति के साथ संतुलन एवं सामंजस्य बिठाने की जरूरत है। प्रधान वैज्ञानिक डॉ. एके शर्मा ने जैविक खेती पर बल दिया। मुख्य वन एवं वन्यजीव संरक्षक डॉ. जीएस भारद्वाज ने थार रेगिस्तान की वनस्पतियों, प्रकृति, वन्य जीवों, पेड़-पौधों, झाड़ियों के बारे में जानकारी दी। मरूस्थलीय पर्यावरण सूचना केन्द्र के प्रभारी डॉ. सुरेश कुमार, डॉ. प्रवीण कुमार और डॉ. ऋतु पुरोहित ने भी अपने विचार रखे।

आफरी में हुए कार्यक्रम में निदेशक एनके वासु ने पर्यावरण संरक्षण को देश के प्रत्येक नागरिक का कर्त्तव्य बताते हुए सोच मे बदलाव की वकालत की। डॉ. तरुणकांत, उप वन संरक्षक (वन्य जीव) महेंद्र सिंह राठौड़, समूह समन्वयक शोध बीआर भादू, उमाराम चौधरी और भावना शर्मा ने भी अपने विचार रखे। पर्यावरण दिवस के मौके पर आफरी मे स्वच्छता अभियान भी चलाया गया।

Patrika, Jodhpur 6 June, 2015

बंजर भूमि से उत्पादन बढ़ाने के लिए मिट्टी की उर्वरता क्षमता को बढ़ाना जरूरीः डॉ. तरफदार

जोधपुर | काजरी के पूर्व प्रधान वैज्ञानिक डॉ.जेसी तरफदार ने कहा है कि शुष्क क्षेत्रों में मृदा की उर्वरता एवं स्वस्थ में कमी है। जिसका उत्पादन पर प्रभाव पड़ता है। शुष्क क्षेत्रों में बंजर भूमि से उत्पादन बढ़ाने के लिए मिट्टी की उर्वरता क्षमता को बढ़ाना होगा ताकि उनमें नमी बनाए रखने की क्षमता बढ़ सके। डॉ. तरफदार विश्व मरूस्थलीय प्रसार रोक दिवस पर काजरी में मरूस्थलीय पर्यावरण सूचना केन्द्र में आयोजित कार्यक्रम को संबोधित कर रहे थे। काजरी के प्रभारी निदेशक डॉ. आरके भट्ट ने कहा कि बदलते जलवायु के अनुकूल विशेष रूप से शुष्क नाजुक भू-भाग क्षेत्रों से कृषि उत्पादन बढ़ाने की आवश्यकता है। पारिस्थितिकी और उपभोग के लिए भूमि का उपयोग संतुलित रूप से हो। विश्व में सुरक्षा, शांति, स्थिरता, पर्यावरण, खाद्य सुरक्षा के लिए निम्नतम भूमि में हरियाली एवं उत्पादन बढ़ाने तथा जल संरक्षण करने की जरूरत है। एनविस प्रभारी डॉ. सुरैया कुमार ने कहा कि विश्व में जनसंख्या का दवाब बढ़ रहा है। मांग के अनुरूप भूमि से उत्पादन बढ़ाना एवं खाद्य सुरक्षा एक विश्व स्तरीय चुनौती है। विभागाध्यक्ष डॉ. प्रवीण भटनागर ने अतिथियों का स्वागत किया। संचालन रीतु पुरोहित ने किया तथा श्वेता माथुर ने आभार जताया।

Dainik Navjyoti, Jodhpur 18 Jun, 2015

स्टेटस सर्वे में 44 गोडावन दिखे, मॉनिटरिंग और सुरक्षा तेज

राज्य पक्षी को बचाने के लिए उसके क्षेत्र विशेष में एनक्लोजर आदि बनाने के लिए करीब 15 करोड़ का प्रोजेक्ट

डब्ल्यूआईआई के वैज्ञानिकों ने तैयार की रिपोर्ट

महेश शर्मा. जयपुर। @mahesh07

राज्य पक्षी गोडावन (ग्रेट इंडियन बस्टर्ड) की गिरती संख्या चिंता का विषय बनी हुई है। इस बार गोडावन के लिए वन विभाग के सहयोग से भारतीय वन्यजीव संस्थान के वैज्ञानिकों की ओर से गई गणना (स्टेटस सर्वे) में 6-7 बच्चों (चिक्स) सहित 44 गोडावन दिखे हैं। यह गणना मार्च-अप्रेल में की गई है, जिसे अब जल्द ही विभाग को भेजा जाएगा। गणना में जहां पर जीआईबी जहां अब तक दिखता आया है, वहां ट्रांजिट में चलते हुए इसको देखकर डेटा इकट्ठे किए गए हैं। यह गणना राष्ट्रीय मरू उद्यान (डीएनपी, जो कि 3 हजार 162 स्क्वायर किलोमीटर है) को मिलाते हुए करीब 25-30 हजार स्क्वायर किलोमीटर (अन्य क्षेत्र जहां बस्टर्ड देखा जाता है) में की गई है। इसमें सलखा, मोहनगढ़, रामदेवरा और फील्ड फायरिंग रेंज शामिल है, यह सारा एरिया डीएनपी के बाहर है, लेकिन इसमें बस्टर्ड नजर आता है।

पिछले साल 39 दिखे, कुल 60 से ज्यादा तक संभव

पिछले साल किए गए स्टेटिक सर्वे में 39 बस्टर्ड नजर आए थे। इस बार बच्चों के साथ कुछ ज्यादा बस्टर्ड दिखने के साथ ही संबंधित वन अफसर इनकी संख्या कहीं ज्यादा 60 के आसपास बता रहे हैं। इसके पीछे उनके तर्क हैं कि गणना में हर पक्षी का नजर आना संभव नहीं। वहीं पोकरण के पास लंबे-चौड़ा आर्मी एरिया में भी गोडावन जाता है, लेकिन आर्मी की ओर से पक्षियों की गणना-सुरक्षा आदि के लिए इजाजत नहीं दी जा रही। उन्हें इस बारे में फिर से लिखा गया है, ताकि बस्टर्ड को लेकर वास्तविक स्थिति सामने आए और उनके बारे में जानकारी जुटा सकें।

बस्टर्ड को बचाने के लिए प्रोजेक्ट

बस्टर्ड की सुरक्षा के लिए कुल 12.9 करोड़ से प्रोजेक्ट तैयार किया जा रहा है। इसके साथ ही जापान बैंक के सहयोग से करीब 3 करोड़ रुपए और मिलेंगे। विभाग इससे बस्टर्ड के हैबीटेट को बचाने के साथ ही अवेयरनेस के प्रोग्राम शुरू कर सुरक्षा के लिए इलाके में एनक्लोजर आदि बनाएगा। इसके लिए बस्टर्ड के रहवास आदि एरिया की पहचान के लिए सर्वे किया जा रहा है। इसका मकसद गोडावन रहवास क्षेत्रों के आसपास हो रहे मानवीय और दूसरे दखल को रोकना है।

आज की तारीख में जब गोडावन की संख्या बेहद कम हो गई है, हमें लेटेस्ट तकनीक यूज करते हुए इसे बचाने के प्रयास करने होंगे। बस्टर्ड की साइंटिफिक स्टडी के लिए सैटेलाइट ट्रांसमीटर (पीटीटी) लगाने की अनुमति मिल चुकी है। इसके बाद डब्ल्यूआईआई की टीम ने प्राथमिक स्टडी की है। जल्द ही बस्टर्ड को ये पीटीटी लगाए जाएंगे।
-गोविंद सागर भारद्वाज, सीसीएफ, वन विभाग

जल्द ही ऐसे वैज्ञानिक अनुभव किए जाने चाहिए, जितना विलंब होगा, उतना इस पक्षी को नुकसान होगा।
-हर्षवर्धन, वन्यजीव विशेषज्ञ

Dainik Bhasakar, Jodhpur 7 May, 2015

विश्व पर्यावरण दिवस पर वृक्ष बंधु पुरस्कार समारोह आज

जोधपुर। आध्यात्मिक क्षेत्र पर्यावरण संस्थान द्वारा विश्व पर्यावरण दिवस पर शुक्रवार को प्रातः साढ़े दस बजे सूचना केन्द्र मिनी ऑडिटोरियम में वृक्ष बंधु पुरस्कार समारोह आयोजित किया जाएगा। संस्थान के अध्यक्ष रामजी व्यास ने बताया कि महापौर घनश्याम ओझा समारोह के मुख्य अतिथि होंगे और अध्यक्षता राजस्थान पत्रिका के प्रभारी संपादक ज्ञानेश उपाध्याय करेंगे। समारोह में देवेन्द्र जोशी विशिष्ट अतिथि होंगे।

सम्मान: विश्व पर्यावरण दिवस के अवसर पर इस वर्ष का वृक्षबंधु पुरस्कार पर्यावरण के क्षेत्र में उल्लेखनीय योगदान के लिए राजस्थान पत्रिका के जोधपुर संस्करण को दिया जाएगा। इसके साथ ही सघन वृक्षारोपण कार्य के लिए गणपत सालेचा, सांस्कृतिक धरोहर पुरस्कार श्रीमती मधु रामदेव तथा वृक्षारोपण कार्य के लिए आशा झांझरिया सहित इन सभी को स्वर्ण पदक से सम्मानित किया जाएगा। उन्होंने बताया कि समारोह में इस वर्ष का अनमोल रत्न पुरस्कार सुप्रसिद्ध अंतरिक्ष वैज्ञानिक ओ.पी.एन. कल्ला, राजस्थान हाईकोर्ट एडवोकेट एसोसिएशन जोधपुर के अध्यक्ष रणजीत जोशी को और लाइफ टाईम एचीवमेन्ट एवार्ड से एड्स नियंत्रण पर विश्व स्तरीय योगदान के लिए डॉ0 कांति जोशी को भी विशेष रूप से सम्मानित किया जाएगा। इस वर्ष का वाई डी सिंह पुरस्कार वरिष्ठ पत्रकार रामेश्वर बेड़ा और वन वात्सल्य पुरस्कार पी आर ओ डिस्कॉम राजेन्द्रसिंह राठौड़ को प्रदान किया जाएगा। पं0 सूरजराज जोशी ज्योतिष पुरस्कार विख्यात ज्योतिषी पं0 मनोज मिश्रा को प्रदान कर सम्मानित किया जाएगा। संस्था द्वारा सांस्कृतिक धरोहर संरक्षण पुरस्कार अनिल गोयल, नूर मोहम्मद लंगा पुरस्कार मुबारक खां लंगा, वराह मिहिर पुरस्कार प्रदीप जोशी, डी डी हर्ष भक्ति संगीत पुरस्कार अमरलाल, श्रवण कुमार झांझरिया, गोपालसिंह को जल पुत्र, रूख भायल आफरी निदेशक, बंजर भूमि पर सघन वृक्षारोपण के लिए विजयसिंह मेड़तिया, संयुक्त निदेशक पेंशन तेजराज शर्मा, मयूर स्कूल चौपासनी, आनंद लाहोटी, जितेन्द्र बोहरा और मोनिका को रजत पदक प्रदान कर सम्मानित किया जाएगा। इसके अलावा विभिन्न उल्लेखनीय योगदान के लिए 31 व्यक्तियों को कांस्य पदक प्रदान कर सम्मानित किया जाएगा।

काजरी में विश्व प्रर्यावरण दिवंस का आयोजन

जोधपुर। केन्द्रीय शुष्क क्षेत्र अनुसंधान संस्थान, जोधपुर में शुक्रवार 5 जून 2015 को विश्वपर्यावरण दिवस डॉ. रहे जा पुस्तकालय में मनाया जायेगा। इस अवसरपर मरूस्थलीय पर्यावरण सूचना केन्द्र के प्रभान अन्वेषक व प्रधानवैज्ञानिक डॉ. सुरेश कुमार ने बताया कि यह दिवस प्रत्येक वर्ष पूरी दुनिया में मनाया जाता है। इस कार्यक्रम के मुख्य अतिथि वन जीवन विभाग के वनीय जीव प्रतिपालक डॉ .जी.एस.भारद्वाज होंगे वे पर्यावरण व जैविक विविधता पर सम्बोधित करेंगें, काजरी के वैज्ञानिक डॉ. ए.के.शर्मा जैविक खेती व जैविक विविधता पर विचार प्रकट करेंगें। इस कार्यक्रम की अध्यक्षता काजरी के प्रभारी निदेशक डॉ. आर.के. भट्ट करेंगें। इस कार्यक्रम द्वारा पर्यावरण संरक्षण हेतु जनचेतना जागृत की जायेगी।

विश्वविद्यालय द्वारा पर्यावरण दिवस का आयोजन होगा

जोधपुर। जय नारायण व्यास विश्वविद्यालय के एडवांस्ड स्टडी सैंटर, वनस्पति विज्ञान विभाग एवं बॉटनिकल सोसायटी द्वारा शुक्रवार को विश्व पर्यावरण दिवस के एक दिन उत्सव का आयोजन किया जायेगा। विश्व पर्यावरण दिवस की इस वर्ष की थीम सात अरब सपने, एक ग्रह, देखभाल के साथ उपभोग हैं। जय नारायण विश्वविधालय के कुलपति डॉ. आर. पी. सिंह समारोह की अध्यक्षता करेंगे और एन.के. वासु आईएफएस, निदेशक, आफरी मुख्य अतिथि होंगे। यह समारोह प्रातः 9.30 से 11:00 बजे तक विश्वविधालय के नए परिसर में स्थित यूसिक आयोजित किया जाएगा तत्पश्चात वनस्पति विज्ञान विभाग में फलों के वृक्षों का रोपण किया जाएगा।

चेतना रैली आज : जोधपुर। विश्व पर्यावरण दिवस पर वन विभाग एवं राजस्थान राज्य भारत स्काउट व गाइड के संयुक्त तत्वावधान में राजकीय बालिका उच्च माध्यमिक विद्यालय शाहपुरा कुड़ी भगतासनी में समारोह आयोजित किया जाएगा। उप वन संरक्षक आर.के.सिंह ने बताया कि जिला प्रमुख पूनाराम चौधरी समारोह के मुख्य अतिथि होंगे। वन संरक्षक दयाराम सारण की अध्यक्षता में लूणी प्रधान श्रीमती नीरज कँवर विशिष्ट अतिथि होंगी।

Tarun Rajasthan, Jodhpur 6 June, 2015

ENVIS CAZRI Website

Following Statistical Databases of Rajasthan (Arid Zone) can be accessed in CAZRI-ENVIS Website

- Crops- Area, Production and Productivity
- Rainfall Distribution
- Human Population - Rural, Urban
- Livestock - Cattle, Buffalo, Sheep, Goat, Camel, Poultry
- Working Human Population
- Density of Human Population
- Sex Ratio
- Irrigation by Canal, Tank, Wells, Tubewells
- Agricultural Equipments - Animal Cart, Electrical Pump set, Oil Engine Pump Set, Plough, Tractor
- Fertilizer Consumption
- Electricity Consumption of Rajasthan
- Landuse Pattern - Forest, Barren and Uncultivated land, Cultivated waste land, Current Fallow, Net Area Sown, Non Agriculture Use, Old Fallow, Pasture and Grazing, Trees and Groves
- Electricity Consumption - Industrial, Commercial, Domestic and Residential Uses
- Temperature
- Humidity
- Mineral Production

Compiled by Shweta Mathur and Akshay Bhardwaj
ICAR-CAZRI, Jodhpur