FIELD FORESTER

VOICES FROM THE FIELD

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From the Chief Editor's Desk

Late Shri A K Upadhyay

The present issue of *Field Forester* consists of case studies from Rajasthan, which have been shaped into final form through sincere efforts of Late Shri A K Upadhyay, the then Principal Chief Conservator of Forests (Training, Research, Extension and Education). The SFS officer trainees, who visited Rajasthan during September-October 2015, had been personally mentored by him through careful selection of case studies for documentation as good practices in the Rajasthan Forest Department.

Late Shri A K Upadhyay, or AKU as he was known to everyone around him, was an extraordinary officer of the 1982 batch of the Indian Forest Service. An MSc in Physics from the prestigious IIT Kanpur, his association with Forestry Training sector had been a long and a very valued one. His tenure as a trainer and mentor at the Indira Gandhi National Forest Academy in Dehradun had created many highly motivated forest officers, when he was posted as Joint Director for seven years. His unorthodox style of training was something that elicited whole-hearted appreciation. He was vociferous, bold, tough, but also accessible and compassionate. Under his guidance, many young forest officers found strength to be bold and upright officers; probably his most important contribution to the country.

After the Academy he moved on to his State cadre of Rajasthan and was associated with many externally aided projects with the World Bank, WFP, JICA etc. The greening of the Indira Gandhi Canal in Jaisalmer and Bikaner was a stupendous achievement for which he was awarded the *Indira Priyadarshini Vriksha Mitra* Award, an honour he truly deserved. In his hardships – easily imaginable in the harsh backdrop of the scorching deserts – he generously and gracefully acknowledged the contribution of his guards, foresters, his team of deputies in greening the canal.

This issue is thus a tribute to the indomitable spirit of Late Shri A K Upadhyay and his cherished service to forestry sector, consisting befittingly of case studies documented from Rajasthan and the contributions of such good practices towards the conservation field in Rajasthan. Protected Areas, such as Keoladeo National Park, Ranthambore National Park and Jaisamund Sanctuary, have exceptional stories to share in the area of eco-tourism and man-animal conflict. Livelihood issues, wildlife management and urban forestry also find a delightful place in this issue through some replicable success stories in the field.

M P Singh

BHARATPUR / RAJASTHAN

Eco-tourism management at Keoladeo National Park

The eco-tourism activities are managed sustainably, keeping in mind the carrying capacity of the area

Waikhom Romabai

Keoladeo National Park in Bharatpur is situated in the floodplains of two tributaries of the River Yamuna – Gambhir and Banganga. Referred to locally as *Ghana* for its dense vegetation, it is a large shallow saucer like depression which extends over an area of about 29 sq km. In 1899, the area was developed into a duck shooting reserve by Prince Harbhanji of Morvi State in Gujarat. Considering its importance for migratory waterfowl it was handed over to the Government of Rajasthan on the advice of National Committee for Bird Preservation. Later, it was declared as a Sanctuary in 1956 and upgraded to a National Park in 1982. It was declared as a Ramsar Site in 1981 and a World Heritage Site in 1985. It is the first wetland in India to be declared as a Ramsar Site.

The Park has been a 'must visit' site for tourists and bird lovers for a long time as it is located on the tourist Golden Triangle between Delhi, Agra and Jaipur. The main attraction of the Park includes the heronry where 15 species of birds nest and breed. The duck shoots in the park over the years inscribed on a wall are an indicator of the acclaim it had as a duck shooting reserve. As an eco-tourism destination it supports a rich floral and faunal wealth comprising of 347 bird species, 379 floral species, 50 species of fish, 13 species of snakes, 5 species of lizards, 7 amphibian species and 7 turtle species.

To promote eco-tourism the Forest Department has taken up two initiatives which include the Eco-Development Committee and Staff Welfare Society. The Eco-Development Committee was formed in 1999 and fifteen villages were selected to be a part of the committee. An Eco-Development surcharge is levied on every ticket into the Park. Proceeds from the surcharge are used for the development of villages and better Park management. Shanti Kutir – the Forest Rest House, books and souvenir shops are run by the Eco-Development Committee members.

Since motor vehicles are not allowed inside the premises of the National Park, the Forest Department promotes pollution free and cheap means of transport like golf cars, bicycles on rent

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and rickshaws for the convenience of the tourists. Only licensed richshaw pullers and nature guides are allowed to operate and the tariff for these services is fixed by the Forest Department. The licenses are renewed every two years and during renewal the rickshaw pullers and guides have to attend a three day training conducted by the Department. It is compulsory to engage a guide if the group is more than ten. Two cafeterias inside the park are run by the Staff Welfare Society, the society is also responsible for maintaining bicycles which are given on rent.

Others facilities include Dr Salim Ali Interpretation Centre, tourist assistance centre, ticketing window, watch towers, nature trails, etc. The interpretation centre funded by Swaroski and Co, an Austrian multi-national crystal company, was created to promote eco-tourism and awareness. The interpretation centre is dedicated to Dr Salim Ali, the 'Birdman of India', acknowledging his pioneer effort for conserving this wetland as a National Park.

The tourist assistance centre has been set up near the entrance of the National Park and is headed by a Range Officer. The Range Officer, tourism is also responsible for the smooth functioning of the Eco-Development Committee created for managing eco-tourism activities inside the Park. Watch-towers have been constructed to provide a birds' eye view of the park Tourism activities are allowed in selected areas for which separate nature trails have been made so that people get an opportunity to see the landscape and diverse bird species. Five nature trails also help lower visitor impact. The best season to visit the park is during October to March. The eco-tourism activities are managed sustainably, keeping in mind the carrying capacity of the area. The Keoladeo National Park is a good example of sustainable tourism with the socio-economic involvement of the local people.

The Ramsar Convention, known earlier as the Convention on Wetlands of International Importance, is an international treaty for the conservation and sustainable utilisation of wetlands. It recognises fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971. The convention was hosted by the Iranian Department of Environment and came into force on December 21,1975. The Ramsar List of Wetlands of International Importance now includes 2,228 sites. The country with the highest number of sites is the United Kingdom at 170 and the country with the greatest area of listed wetlands is Bolivia, with over 140,000 km^2.

Acknowledgement

I owe my sincere thanks to Mr Bijo Joy, IFS, DCF(WL), KNP, and his staff for their guidance, cooperation during our case study tour and also for their keen interest, valuable suggestions and help. I would also like to acknowledge Rajasthan Forest Department for making our case study a successful one.

UDAIPUR / RAJASTHAN

Livelihood enhancement through *Aloe vera*

Aloe Vera plantation in Atatya village has transformed the lives of the people living in this remote and poor region of the state

D John Sha

A case study of livelihood enhancement through *Aloe vera* was documented at Atatya village in Ogna range of Udaipur district, Rajasthan. Atatya has 270 households with a population of about 2,000. The communities residing in this village consist of Rajputs, Garasias, Bhils, Kathodi and Damors. It is approximately 75 km from Udaipur city. *Aloe vera* has been planted in Makadia block medicinal plantation, under Raidari Forest Blocks, in an area of 125 ha. The plantation project is funded by the Tribal Area Development (TAD), Japan International Co-operation Agency (JICA) and Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).

Plantation of *Aloe vera* was done by the Forest Department for conservation purposes and soil binding in degraded areas under various schemes in Makadia block medicinal plantation, which is 1.5 km from the Ogna Range. Since the plantation of *Aloe vera* was successful and could benefits the tribal population in the area, it came under Tribal Areas Development (TAD) in 1996-97 with an area of 50 ha. At this point, though the plantation was successful, it was not commercially viable.

***Aloe vera* grown in natural forest**

SFS 2015-17 batch

The Forest Department and the villagers met and agreed for value-addition of *Aloe vera* for further development of the village economy. They later came to an understanding that a small-scale industry will be established for the livelihood needs of Atatya village. Therefore, in 2007-08, Makadia plantation was developed as a key project for employment and commercialisation through MGNREGA. Under this project, 50 ha along with 75 ha of forested area were selected for *Aloe vera* plantation.

The *Aloe vera* saplings were brought from Ballav Nagar and Chittorgarh and were planted at a distance of 1m x 1m (plant-to-plant) in the natural forest. The commonly found tree species in this forest are *Cassia tora, Emblica officinalis, Pongamia pinnata, Leucaena leucocephala, Helicteres isora,* etc. After plantation, *Aloe vera* is harvested after 1-2 years. Plucking and collection of leaves is usually done just after monsoon – August-March, as it is a rainfed area.

Normally, a single leaf weighs 400-600 gms and each plant can yield about 1.5-2 kg of fresh leaves. About 30 per cent of juice can be extracted from a single leaf. It is reported that presently there are about 15 lakh plants in the plantation area. The unit can be effectively operated from September to February – i.e, 6 months in a year – while the cost of unit can be recovered within three months of operations. In the processing unit there are 6 employees and for collection of raw materials, 50 employees. The building for housing the equipment and products was provided by the Forest Department, Government of Rajasthan.

Processing of *Aloe vera* leaves consist of the following steps:

Step 1: Cutting of leaves – Harvesting of the matured leaves from the plants by cutting.

Step 2: Cleaning – Removing of unwanted substances from the leaves.

Step 3: Side cutting – Removing and slicing off the sides of the leaves using knife.

Step 4: Separation of pulp – The pulps are separated from the covering layers for further processing.

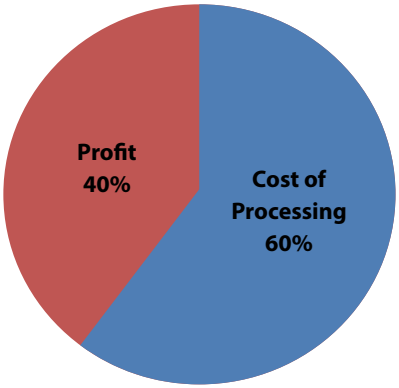
Step 5: Seiving – Homonizing and filtering of the pulp.

Step 6: Testing – Testing of the finished products for quality, using various methods.

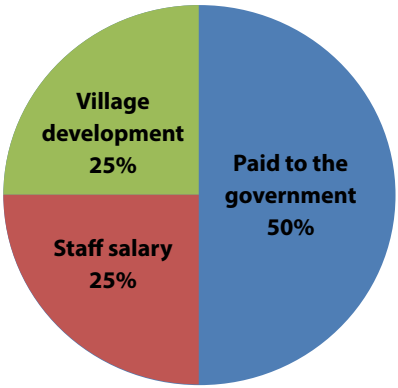
Step 7: Packing – The products are packed in different containers according to the use for marketing and dispatching.

The products obtained from *Aloe vera* are shampoo, face cream and juice. *Aloe vera* is known for its medicinal value; it is used for liver and stomach problem, arthritis, knee joint problem, reducing blood sugar, curing cancer, controlling high blood pressure, healing of wounds, anaemia, hairfall, weight loss and cosmetics. The production is certified by Biocent India as an organic product by certificate no. ORG/SC/ 1307/ 00093, which is approved by the USDA. This is the only processing unit approved in this area.

The process of extraction of *Aloe vera* juice and other techniques was



Percentage break up of Processing Cost & Profit



Break up percentage of the profit earned

With Mr Manohar Singh (President, AVFMC) and forest officials at Atatya village

taught to the workers in the Maharana Pratap Agriculture and Technology University, Udaipur, which is under the post-harvest department. The trainees were given hands-on training after the completion of their course and before starting work in the processing unit. Purchasing of machines and handling techniques were also supported by the Maharana Pratap Agriculture and Technology University.

Since the processing unit is far away from the cities, it is difficult for the villagers to do the marketing by themselves. Therefore, to market the products, a distribution stall was inaugurated on February 14, 2009, under the aegis of the District Magistrate and CCF, Udaipur. The theme of the stall, which is still functional, is "Plantation of Health & Prosperity of Village". When the production was started, it yielded about 4,000 litres of *Aloe vera* juice per year. Now, it is producing about 22,200 litres per year. The *Aloe vera* juice is sold at Rs 120 per litre.

This is the first of its kind processing unit in the underdeveloped tribal areas

of Rajasthan, aimed at strengthening livelihood, economic empowerment and conservation of forest. The success of *Aloe vera* processing unit has encouraged entrepreneurship among the tribal farmers of this area.

Though *Aloe vera* plantation was done by the forest department for conservation purposes, it became useful after value addition. This is a classical example of the Forest Department helping the poor tribal community in self-sustenance and livelihood as well as for conservation of the natural forest. Because of the benefits from the forest for their sustenance, the people took active participation in conserving and protecting the forest which, in turn, helps the Forest Department in fulfilling the task and management of the forest sustainably.

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1. Mr O P Sharma, IFS, DFO (Udaipur), Udaipur, Rajasthan.
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5. Mr Manohar Singh, President, Atatya VFMC, Udaipur, Rajasthan.
6. The forest staff of Udaipur Forest Division, Rajasthan.

UDAIPUR/RAJASTHAN

Livelihood generation through Agarbatti production

Sustainable livelihood generation by production of Agarbatti from bamboo staffs has proved to be a successful endeavour in Thamla Beri village

Chinpilhing Kipgen

In rural areas, young people aspire to migrate and to work in quarries and factories. Many people in the prime earning group (21 to 45 years of age) migrate regularly on a seasonal basis. The farms are run by women and the elderly, with some help from children. Livelihood objectives for those who stay back have predominantly survival aims. Higher level objectives are largely pursued through migration and non-farm employment. NTFPs are considered to be important for sustaining rural livelihoods, reducing rural poverty, biodiversity conservation, and facilitating rural economic growth.

Taking into consideration the importance of livelihood generation in rural areas through NTFP, a case study was documented to understand the scope for livelihood generation for tribal communities through production of *Agarbatti* at Thamla Beri Village of Udaipur district, Rajasthan. The Scheduled Caste and Scheduled Tribe population in Udaipur district is 6.1 per cent and 49.7 per cent, respectively, whereas the State per cent of SC and ST population is 17.8 and 13.5 per cent, respectively. The economy of Udaipur district is mainly dependent on agriculture as 61.7 per cent workers in the district are either cultivators or agricultural labourers.

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Figure 1. ***Dendrocalamus strictus*** **in the village**

Thamla Beri is a medium size village, located in Kotra of Udaipur district comprising 102 families. The village has a population of 598, of which 321 are males while 277 are females, as per the Population Census 2011. There are 135 children, which makes up 22.58 per cent of the total population of the village. The Average Sex Ratio is 863, which is lower than the Rajasthan state average of 928. The Child Sex Ratio is 776, lower than the Rajasthan average of 888. The village has a lower literacy rate compared to State figure. In 2011, literacy rate of the Beri village was 47.52 per cent, compared to 66.11 per cent of Rajasthan. Male literacy stands at 53.88 per cent while female literacy rate is 40.37 Per cent. As per the Constitution of India and Panchyati Raaj Act, Thamla Beri village is administrated by the Sarpanch (Head of Village), who is an elected representative of the village.

Case facts

In this district, *Dendrocalamus strictus* is available in abundance and when it is harvested, unused bamboo is left behind. These remaining bamboo staffs are used for making *Agarbatti*. No sophisticated machine or technology is used for this and hence, the method is very feasible for the community. Due to its simplicity and hand-operated machine, the process doesn't require a highly skilled labour and can be produced in every household. Since the activity is socially and economically feasible, this endeavour is successful in the community. Further, the community is interested in conserving the bamboo as it is the raw material for the preparation of *Agarbattis*.

The women of the village organise themselves into a self help group (SHG) and constitute the workforce in making of *Agarbattis*. Mr Padam Singh (Forester)

and Mr Jaswant Kumar (Asst. Forester) of the Forest Department provide the technical support. The Village Forest Protection and Management Committee (VFPMC) monitors the activity of the SHG. The SHG consist of 12 members, each earning Rs 200 per day. The main season for production are January, February and March. The activity is stopped during the rainy season.

The process

Materials required:

1. Bamboo cutting machine
2. Chip making machine
3. Stick making machine
4. *Masala* or mixture
5. Fragrance/Essence
6. Packaging material

Steps of production

Bamboo Cutting: The bamboo is cut into pieces of 8 inches, taken from between the node.

Chip Making: The bamboo cuttings are passed through chips making machine, producing 1mm thick strips.

Stick Making: The bamboo chips are passed through a hand-operated stick making machine, producing a 12 bamboo stick of size 1.5 x 1.5mm.

1. Rolling of *masala* onto sticks: The bamboo sticks are rolled with inscense mixture by passing them through a rolling machine previously filled with *masala* mixture and taken out manually. The rolled sticks with incense mixture are dried in shade for 4-6 hours.

Figure 2. **Bamboo cuttings made into chips using hand-operated machine**

The content of masala mixture

Wood husk, cow dung, charcoal, jiggit and jaggery.

Addition of fragrance: The incense stick is dipped into a fragrance solution and allow by placing it on a newspaper.

2. Packaging: The incense sticks are packed in different colours, according to the fragrance used. The packed products are marketed under the brand name '**Van Raj'.**

Figure 3. **Bamboo chips made into sticks**

Figure 4. **Masala mixture rolled onto the sticks**

Figure 5. ***Agarbatti*** **sticks are dried**

Figure 6. **The finished products ready for marketing**

Flow chart for *Agarbatti* production

BAMBOO CUTTING
⇩
CHIPS MAKING
⇩
STICKS MAKING
⇩
ROLLING OF MASALA ONTO STICKS
⇩
ADDITION OF FRAGRANCE TO INCENSE STICKS

PACKAGING AND MARKETING

Conclusion

- Non-timber forest products play a vital role in livelihood of people in and around the forests.
- Sustainable livelihood generation by production of *Agarbatti* from bamboo staffs remain after harvesting.
- Creating awareness among the communities in conserving natural resources.
- Women's role and contribution to forest-based livelihoods
- Participation of women in the forest-derived economy as primary collectors of forest produce, as wage employee in forest-based enterprises and in forest management.

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- Mr M P Singh, Director, DFE Dehradun
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- Mr Mohan Raj, DFO, Rajasthan Forest
- Rajasthan Forest Department

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- Mr Mohan Raj, DFO, Udaipur Forest Division

Cost of production of *Agarbatti*

Bamboo Sticks		Rolling Price				Addition of fragrance		Cost of packing	Total (6+7+8+9)	Market price	Net gain
Weight 1	Cost 2	Weight 3	Cost 4	Labour Cost 5	Total (2+4+5) 6	Cost of fragrance 7	Labour Cost 8	9	10	11	12
300 (gm)	Rs.10.5	700 (gm)	Rs.17	Rs.20	Rs.47.50	Rs.62.50	Rs.10	Rs.18	Rs.138	Rs.250	Rs.122

JAIPUR / RAJASTHAN

Urban Forestry in Jaipur

Smriti Van in the heart of Jaipur city is an example of developing a forest amidst a densely populated urban area

Abbas Ali Dewan

Urban forestry is the management of trees for their contribution to the physiological, sociological and economic well-being of urban society. It deals with woodlands, group of trees and individual trees where people live. It needs to be planned and integrated and systematic approach to urban tree management should be stressed upon. Parks and green spaces are the backbone of sustainable and high quality urban environment. Urban forestry is concerned primarily with environmental enhancement, control of air and noise pollution and microclimatic modification. People appreciate that urban forests serve important social, psychological health, aesthetic, ecological and economic functions.

The total area of forest land in Jaipur, Rajasthan, is 946.25 sq km, 8.51 per cent of the total geographical area. A biodiversity forest, Smriti Van is located on JLN Marg, Jaipur – 45 hectares of land surrounded from all sides by densely populated colonies and institutes. The forest land of Smriti Van is a part of the forest block, Kho Nagoriyan-Jhalana Doongri 93, which was declared as a Reserved Forest. Due to incessant rains in 1981, Jaipur witnessed its worst flood. The fury of the flood washed away the vegetation of tracts of land. All that was left were deep *nallahs* and shifting sand dunes along their banks. The Forest Department, in its endeavour to stabilise the sand dunes, planted *Acacia tortalis*, which came up well on the sandy tracts. At the onset of the 21st century, the Forest Department and some citizen groups put forward the idea of planting a sapling in the memory (*smriti*) of their beloved ones. Kapoor Chand Kulish Smriti Van derives its name from the renowned Vedic scholar and journalist, Kapoor Chand Kulish. After arduous work of two years, Smriti Van was fully developed. It consists of 10 sections – Vasundhara Van, Eco-Environmental Museum, Maru Van, Aravali Van, Sarovars, Rashtriya Van, Herbal Garden and Yoga Garden. It was dedicated to the State in the year 2008.

Smriti Van has two walking trails, measuring 3 km and 700 metres, respectively. These trails go through small hillocks and loosely deposited small sands dunes. These tracts are maintained on a daily basis. Walkers are greeted by a large number bird and flora species. There is a Yoga

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Garden that enables health-conscious persons to sweat it out and six lawns, where visitors can relax. Dhanvantari Van, a section of Smriti Van, boasts of about 230 medicinal plants. Local staff and experts impart knowledge about medicinal plants and their uses in various ailments. Some medicinal species extensively used to treat a wide variety of diseases are *Tinospora cordifolia* (Giloy), *Ashavgandha, Aloe vera barbadensis* (Guarpatha), *Pathar chatta* and *Kalihari*. A 'Sanjeevani Upchar' camp is organised by the office at Smriti Van each Sunday between 7 am and 12pm. The Ayurveda treatment using local medicine herbs is being given by an Ayurvedic *vaid*. Total number of patients who have benefitted in the last four years from these camps are 5,507.

The museum in Smriti Van is so designed that it does not require fans, cooler and ACs for cooling. There is an exhibition room that depicts the landscape before and after the creation of Smriti Van. There is a small auditorium that caters to the need of visiting students. One hall of the Museum is dedicated to flowering plants.

There are some valleys crisscrossing the sandy terrain of Smriti Van. The slopes of these valleys were first treated and stabilised by vegetative method. Then some water ponds (*sarovars*) were created to provide habitat to aquatic plants and animals. The *nallahs* and ravines have been treated according to soil conditions to check erosion – by creating earthen check dams, dry stone check dams, and degradable mesh layering for sand dunes' stabilisation. Smriti Van quenches its water need by using treated wastewater; about 80 per cent of the total water requirement is met from wastewater treated by sedimentation process.

Biodiversity

Smriti Van is a hub of diverse flora and avi-fauna. The flora ranges from Xerophytes on one extreme to aquatic flora on the other. Vegetation found in desert, such as *khejari (Prosopis cineraria*) can be seen here along with *rohira*, *kadam* as well as *bahera* (*Terminalia belerica*), usually found in moist regions. Till now, 137 species of birds have been spotted in Smriti Van.

The urban forest land being developed in Jaipur is a joint venture between the Forest Department and the Jaipur Development Authority (JDA). The land belongs to the Forest Department and JDA provides funds for the development activities of urban forest. The maintenance of the forest area is also being done jointly, JDA is providing funds and the Forest Department is looking after all affairs.

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RANTHAMBHORE TIGER RESERVE / RAJASTHAN

Man-animal conflict in Ranthambhore

A look at the perspectives of both the sides affected by tiger attacks on human beings in Ranthambhore – the villagers and the foresters

Laishram Gitla

Can someone ask the people who are protesting for the relocation of T24, how they would feel if the tiger killed someone from their family. If the tiger comes back then we, the villagers, will protest, burn the forest down and will even kill the tiger, even if we have to go to jail," said a relative of Rampal Saini, the Forest Guard who was killed by Tiger named T24 near the entrance of Ranthambore National Park on May 8, 2015. His resentment and anger was justified. Would one want to nurture an animal who had snatched away their beloved husband/father/brother from them forever? Nonetheless, what is the fault of the speechless creature? The only fault was that he pounced upon the ill-fated Forest Guard. A helpless Forest Guard expressed his frustration, "T24 attacks forest staff, and if he attacks a local villager, the villagers hit us too." This is the situation which the Forest Guards and people residing in the nearby villages of Ranthambhore National Park in Sawai Madhopur district are facing today.

Take the case of Daulat Singh Shaktawat. He escaped an attack by the tiger by losing his right eye and with a broken jaw? He lost his eye when a terrified and confused tiger, which was being harassed by a mob of over 3,000 villagers, attacked him when he was trying to tranquilize it at Bhoori Pahari area of Ranthambhore on August 10, 2010. With an artificial eye, which he sterilizes daily, and half a paralysed face, Daulat Singh narrated about that fateful day when he was manhandled by the agitated villagers because the tiger entered their agricultural field and how he was mauled by that tiger. When asked what he feels about the whole incident, his first comment was, "It was not the fault of 'T-Seven'. The tiger would have quietly returned to the forest had the villagers not forced him back. After I was discharged from the hospital, I learnt that T-Seven had wandered out of Ranthambhore to Karoli. And he moved to Dholpur and Mathura, and then all the way to the Keoladeo National Park in Bharatpur. He stayed there for four months. When the Wildlife Institute of India team went to tranquillize T-Seven so that he could be released in Sariska, I insisted to accompany the team because I wanted to be assured that the tiger I saved from the mob was released

ACF Trainee, SFS Batch 2015-17, CASFOS - Dehradun

safely there." Indeed this incredibly brave heart man is the prototypical tiger defender.

"Crowd management is not the specialty of the Forest Department. Handling a tiger is not so difficult a task, but trying to tranquilize a provoked tiger surrounded by curious crowd is indeed very challenging and dangerous too. Had the crowd been controlled by the administrative department and the police, and had Daulat Singh been allowed to carry out his duty to tranquilize the tiger, he would not have been mauled by the big cat. It was his destiny that kept him alive to tranquilize that tiger again after he recovered," opined Dr Dharmendra Khandal, Conservation Biologist, Tiger Watch, an NGO dedicated to conservation and protection of wildlife in Ranthambore.

Tigers stray out of the core zones and enter in a conflict with humans. Species habitat loss, degradation and fragmentation due to land use transformation because of the ever increasing human population growth, leads to overlapping of the requirement of wildlife and human populations. Shortage of space and shrinking wild prey population are the key reasons for the conflict. Often tourism activities are also held responsible for human-animal conflict. It is quite natural for animals to compete with humans for access to habitat, food and water. It is their birth right. Ranthambhore has witnessed nine human killings by tigers since the area was declared National Park in 1980. Many human beings have been injured in tiger attacks and numerous cattle are preyed upon by the big cats.

"Better wildlife monitoring, innovative measures, well-equipped rescue teams, adequate compensation, crowd/incident management with the help of other departments such as administrative department and police, and thoughtful management decision for the problem animal could be some of the solutions that could be rendered for man-animal conflict," said Dr Khandal.

Mr Sudharsan Sharma, DCF, Sawai Madhopur, stated, "Relocation of T24 from Ranthambhore Tiger Reserve to Sajjangarh in Udaipur has been met with resistance from wildlife activists. However, had T24 not been relocated, Ranthambore would have lost the support of the local community and Forest Guards."

It reminds me of what Mr S K Chakrabarti, IFS, Former Principal Chief Conservator of Forests and Chief Wildlife Warden, Karnataka, wrote, "These are the brave men who make sacrifices in the face of the most difficult situations in man-animal conflict in our country. These are the unsung heroes for whom not a drop of tear is shed in the face of the most critical situations that they as forest officers face. Unfortunately, such braveries go almost unnoticed and forest officers are blamed for the conflict situations arising out of man's encroachment into forests, the abode of wildlife." And there is no second opinion about that!

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Sawai Madhopur, for providing all necessary support regarding our case study tour. Special thanks to Mr Daulat Singh, ACF, Sawai Madhopur, Mr Subhadeep, Biologist, Ranthambhore Tiger Foundation, Ms Zaara, Sociologist, Ranthambhore Tiger Foundation, and Dr Dharmendra Khandal, Conservation Biologist, Tiger Watch, for their help and for sharing their vast experience of wildlife problems and management.

JAISAMAND / RAJASTHAN

Promoting eco-tourism in Jaisamand Sanctuary

The Jaisamand Wildlife Sanctuary near Udaipur has tremendous potential to make a mark in tourism as it boasts of immense biodiversity along with heritage buildings

Preeti Buragohain

Situated in the most fragile ecosystem of Aravallis, Jaisamand Wildlife Sanctuary is 50 kms to the south of Lake City, Udaipur. A glimpse of history of Mewar reveals that the forests included in the Sanctuary used to be Shikargah of the erstwhile Maharanas of Mewar. The world-famous Jaisamand Lake constitutes an integral part of the Sanctuary. Jaisamand, or Jaisamudra, lake is one of the largest artificial bodies of freshwater in the world. It was bBuilt three centuries ago by Maharana Jai Singh of Udaipur, who on its inauguration on June 2, 1691, walked around it distributing gold equal to his own weight in charity. He built six cenotaphs with finely embroidered elephants in front of the temple of Lord Shiva in the centre of the embankment. The lake measures 14 km in length and 9 km in width. The lake has a circumference of nearly 88 km. The Sanctuary forms the water catchment zone of the lake. From this famous lake the Sanctuary has derived its name, Jaisamand Wildlife Sanctuary.

Jaisamand Wildlife Sanctuary is situated between 73^0 37′ – 73^0 40′ east longitude and 24^0 35′ – 24^0 39′ north latitude. It spreads over an area of 52.34 sq km. Legal boundary of this Sanctuary includes Maniyol and Dhuniwala Reserved Forest Blocks. It was declared as Jaisamand Wildlife Sanctuary by the Government of Rajasthan notification No. F.39(2) Forest. 1955, dated November 7, 1955, under the provisions of Section 5 of Rajasthan Animals and Birds Protection Act, 1951.

The Sanctuary is rich in faunal and floral diversity. The species found here are Leopard, Jungle cat, Indian fox, Chinkara, Spotted deer, Wild Boar, Nilgai, Sambhar, Hyena, Jackal, Common Civet, Small Indian Civet, Langur, Common Mongoose, Indian Hare, Indian Porcupine, Python, Cobra, Rat Snake, Monitor Lizard, Grey Francolin, Babblers, Night Jars, Doves, Yellow-legged Green Pigeon, Owls, aquatic birds, Shikra, Buzzards, etc.

Major floral species found here are Dhokda *(Anogeissis pendula)* , Godal *(Lannea grandis)*, Salar *(Boswellia serrata)*, Ber *(Ziziphus mauritiana)*, Ghatbor (*Z. xylopyrus*), Kadaya *(Sterculia urens)*, Khirni *(Wrightia tinctoria)*, Khirna

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(Wrightia tomentosa), Hingot (*Balanites aegyptica*), Churel *(Holoptelia integrifolia)*, Kher *(Acacia catechu)*, Kumtha *(Acacia senegal)*, Vish Tendu *(Diospyros montana)*, Safed Dhok *(Anogeisses latifolia)*, Mahuwa (*Madhuca indica*), Peepal (*Ficus religiosa*), Khajur (*Phoenix sylvestris*) etc.

This Sanctuary has a great potential for development of eco-tourism. Besides biological heritage – world's second largest freshwater lake is here – it has many historical buildings, which could attract a large number of Indians and foreigners. Also, there is a good network of trekking routes and hiking trails, rich in faunal and floral diversity and with scenic landscape. This will help uplift the socio-economic status of local people. There are a number of ongoing eco-tourism activities in the Sanctuary. A Nature Interpretation Centre was started in the year 2000 in the Hawa Mahal Palace. The centre has a few translides depicting the geographical and historical features of the area. There are also posters and pamphlets showing the flora and fauna of the Sanctuary. Hiking, trekking, walking and driving in forests is a major tourist activity which, if carried out carefully and responsibly, is non-destructive to environment and provides educational and recreational value to the tourist. There are four eco-trails in the Sanctuary –Dheemada Bagh to Palodara, Forest Rest House to Hawa Mahal, Chatpur Gate to Roothi Rani ki Mahal and Mahudi to Jhumar Baori.

Jhumar Baori, a day camping site, has been developed in the vicinity of the Sanctuary. Visitors can enjoy with their families in the thatched *jhompras*. A thatched meeting space is available here which can house 50 persons. Various adventurous game facilities are also available at Jhumar Baori camping site. An ancient stepwell, full of clean water, amidst a tamarind (*Tamarindus indicus*) grove is worth seeing. A picturesque wild date palm grove is present in continuation. Rakheshwar Mahadeo, a holy place, famous for ancient Lord Shiva temple, is 500 metres from the *baori*.

Another important feature of this sanctuary is the presence of historical buildings, like the Saladia Kot Odhi and Hathan Wali Odhi, which were the shooting spots of the Maharanas of Mewars. Today they are used as viewpoints. The Forest Rest House in the Sanctuary is also a heritage building.

Inspite of the eco-tourism potential as well as the ongoing eco-tourism activities here, the number visitors and revenue generation is quite less. The reason may be lack of manpower, proper nature guides, tourism reception centre, signages, hoardings in the nearby areas, basic facilities like drinking water and washroom for tourists, poor infrastructure, poor management, partially developed Nature Interpretation Centre, poor maintenance of trekking routes, limited number of brochures due to financial reasons and less publicity.

For gearing up eco-tourism activities, different initiatives have been taken up by the Forest Department like collaboration with the Centre for Environmental Education (CEE), Ahmedabad, for zeroing in on a particular area of interest and suggesting some

eco-tourism activities for sustainable development. The Department is also planning to introduce Public Private Partnership (PPP) Mode and Homestay concept, which will uplift the socio-economic status of the people living in villages nearby.

Considering the constraints in the promotion of eco-tourism, some more initiatives can be taken, like encouraging the participation of local people focussing more on their empowerment, creating stakeholders, monitoring and evaluating the activities, regular training of the guides and forest personnels, infrastructure development and organisation of education and awareness programmes. These steps could lead to the progress in the field of eco-tourism in the years to come.

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JAIPUR / RAJASTHAN

Prospects and challenges at Nahargarh Zoological Park

The move to shift the Jaipur Zoo to the Nahargarh Zoological Park, 22 km from the city, brings with it a set of issues that need to be resolved and a number of advantages

Rebika Soibam Chanu

Zoos are the main centres of conservative wildlife education and interpretation in ex-situ condition so as to create a wider public appreciation, awareness and empathy. The zoo also aims at wildlife research to promote effective management. The Nahargarh Zoological Park, affiliated with the Central Zoo Authority of India, is being developed for the proposed shifting of the Jaipur Zoo. It is situated in reserved Aravalli ranges of Rajasthan, about 22 km from the Jaipur city on the Jaipur-Delhi National Highway. The park, with a total area of 720 ha, is a unique blend of nature and heritage as a result of interaction of more than one ecosystems, namely wetland, riparian and Aravalli hills. The Jaipur Zoo was established in 1876 during the reign of Sawai Ram Singh II and has 64 animal enclosures at present. The fauna includes 320 mammals belonging to 21 species, 309 birds belonging to 23 species and 120 reptiles belonging to 7 species. It consists of both herbivores and carnivores. There are also six aviaries for water birds and eight aviaries for terrestrial birds. Conservative breeding of Gharials, Khalij Pheasant and Wolf, alongwith proper animal health care, are taken up here. A large number of visitors visited the zoo in 2013-14 – 12.71 lakh, according to official record.

The existing enclosures in Jaipur Zoo no longer comply with the Central Zoo Authority norms of the Recognition of Zoo Rules, 2009, and thus the proposal was made for shifting it to Nahargarh Zoological Park, where the display of animals are to be taken up on the concept of nature immersing enclosures. The Master Layout plan and the drawings of the enclosures for animals have been approved by the Central Zoo Authority. The total outlay from RFBP Project is Rs 19.20 crore. The executing agency for civil works is RSRDC, Forest Department of Rajasthan, PWD and JDA. However, it is a challenging process. The paper deals with the prospects and challenges associated with the Nahargarh Zoological Park. Field visits, official records and repeated interaction with forest officials as resource persons were employed for the present study.

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Challenges

Planning approval by CZAI: It happens sometimes that some animal enclosures approved in haste turn out to be inconvenient and suffocating for the animals. As such, new approvals have to be acquired.

Departmental conflict with implementing agency: In Nahargarh Park, the landscaping work is being taken up by JDA, while road development is being done by PWD. Sometimes they fail to produce the exact structure laid down in the approved work plan.

Time-bound completion: Miscommunication with the implementing agency and the necessity to reconstruct some structures delays the work, resulting in failure to complete the project in scheduled time.

Visitors: The present Jaipur Zoo being at the centre of the city, gathers a lot of visitors annually. Thus, it generates a huge income to the State. The Nahargarh Zoological Park, on the other hand, is situated away from the city.

Prospects

Bus service: The department has a proposal for the introduction of a tourist bus service that would connect the old zoo and the Nahargarh Park. The fare would be incorporated in the ticket entry fee itself.

Road maps and signages: To guide the visitors to various enclosures, toilets, etc.

Visitors' safety: The enclosures are kept at a safe distance from the visitors. This ensures less disturbance to the animals as well as protection from attack by animals.

Children section: The department also envisages introduction of a learning-by-play method of animals in the zoo or their habitat by mud models, etc.

Drinking water and sanitation: Provisions for safe drinking water and proper toilet facilities are provided inside the Park.

Resting places and lawns: Eco-friendly structures and beautifully carved out lawns with varieties of flowers are developed to enhance aesthetic values.

Enclosures close to nature and natural habitat of the animals: Climbers and bamboos over and inside the cages are planted to give natural habitat to both the animals as well as the visitors.

Full view of the enclosures: The enclosures are designed on nature immersion mode so as to give full view of the wildlife in the enclosures.

Interpretation centre: An interpretation centre to educate and make the visitors aware about the conservative management of animals.

Well-established roads: The roads are being laid with thick, smooth concrete for convenient walking.

Elephant safari: The stately custom of roaming in the jungle on an elephant back is re-introduced in the park.

Sura ki Baori: It is an ancient well that has steps.

Diversities around the Nahargarh Zoological Park: It has vast biodiversity. In winter, the Ram Sagar Dam is populated by migratory water birds like Large Cormorants, Greylag Geese, Coots, Pintails and Teals, and the

surrounding forests are visited by territorial bird species like Golden Orioles, Golden-back woodpeckers, Indian Pitta and other beautiful birds. The rare White-Naped Tit is the local resident of the Park. The mammal species are dominated by the Panther. Other species are Blue Bull, Hyena, Porcupine, Jackal, Fox, Jungle Cat, Desert Cat, Civets and Mongoose. Crocodiles are also found in the Ram Sagar Dam.

Rescue centre: It is located next to the zoo. The rescue centre was started in 2002 following the Supreme Court ban on display of animals in circus. It is for tigers and lions only and can accommodate a total of 50 animals: 30 lions and 20 tigers. Presently, only 7 animals (2 lioness and 5 tigeress) are here. The cage height is 3 metres, breadth 20 feet and length 100 feet, while the mess wires are inclined at an angle of 45°. It has a proper crematorium site for dead animals.

Eco-tourism advantages: This will enhance livelihood opportunities of the local people through gainful employment, alongwith promotion of indigenous handicraft and traditional foods and similar mini and micro consumer-based eco-friendly products.

Bird watching: Since a variety of resident as well as migratory birds are found here, the Park has good prospects for birdwatchers.

Nature trails: For adventure lovers and jungle walkers, it provides various nature trials meandering through jungles and provides superb view of the forests and the valley from the hill top.

Conclusion

Zoo management is a very challenging process. We need to look into every detail of animal behaviour and their habitat for successful management of the zoo. It requires huge amount of funds and manpower for maintenance of animal enclosures, feed for animals, animal healthcare, maintenance of zoo, drainage, water supply, electricity, etc. The Nahargarh Zoological Park complies strictly with the guidelines of the CZAI for maximum comfort and well-being of the animals as well as safety of the visitors. The challenges can be overcome. Also, income can be generated by means of entry fee, elephant rides, toilet lease, bicycle charges, leased parking areas and food and refreshment outlets such as hotels, snack bars or a soft drink counter, etc.

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UDAIPUR / RAJASTHAN

A critical analysis of the Sajjangarh Biological Park

The Sajjangarh Biological Park has a tremendous scope for initiating conservation breeding programmes with global collaborations while playing an effective role in reducing man-animal conflicts

Sayambrita Dutta

We rely on wildlife and plants more than most people appreciate the fact. Tremendous monetary losses as well as damages to ecosystem may result from reduction in wildlife population. These inter-relationships between plant life and animal life cannot be neglected or ignored, as they are connected both in farmland and natural habitat. In urban societies, people hardly get an opportunity to know and learn about this interaction. This is primarily because their experience is separated –fauna in zoos and flora in botanical parks or gardens. Displaying both elements together could help the public to understand the importance of both and their role in our lives. In recognition of inseparable relationships between animals, plants and humans, the concept of a biological park has been developed. A biological park is a living interaction of the seen and unseen worlds that constitute our reality, a dynamic interactive place where life evolves. It is a concept of integrating fauna, flora and humans in a non-barriered area of a balanced ecosystem.

The need for creation of a biological park is primarily for wildlife education, conservation and creation of empathy for wild animals in society, preservation of endangered and threatened species, understanding the unique faunal wealth of the area, scientific study and research on animal behaviour, reproduction, disease, provide recreational facility with nature, livelihood security by eco-friendly means and to avoid stress to wild animals from tourists.

The concept of ex-situ wildlife conservation in Udaipur dates back to 1878 when the then Maharana Sajjan Singh established a zoo for the preservation and display of wild animals at the heart of the city in Gulab Bagh. It is spread across an area of 5 ha, including a botanical park. It is situated in the 'No Construction Zone' of the city. Since the Central Zoo Authority of India is the sole authority for the regulation of zoos in India, the Udaipur Zoo, being a heritage building, has not been able to meet with the latest barrier specifications as laid out

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in the guidelines by the Central Zoo Authority of India as far as the holding or display of animals are concerned. Due to this reason, the status of the zoo was downgraded and it is proposed to be converted into a Bird Park. The Government of Rajasthan has taken up steps to shift these wild animals to a larger territory wherein they will be provided a natural environment in the form of a satellite zoo at the Sajjangarh Biological Park, at the foothills of the Sajjangarh Wildlife sanctuary in an area of 36 ha of an un-classified forest. It is only 5 km from the Udaipur city and the area acts as a translocation zone for wild animals. The project was taken up in 2004-05 and the Park was inaugurated on April 13, 2015, and was opened for tourist.

The estimated budget for the Biological Park at Sajjangarh is Rs 20.36 crore. The Park is an outcome of three collaborating agencies. The Rajasthan State Road Development Corporation (RSRDC) is the main working agency with fund assistance from JICA, along with the Public Works Department (PWD), which is responsible for the construction of roads and the transfer of funds, and guidance is carried out by the State Forest Department.

The master plan layout of the Sajjangarh Biological Park was approved by the CZAI on August 28, 2009. There are 28 'Open to sky' and 'Borrow the landscape' enclosures, which hold around 115 numbers of birds, reptiles and wild animals like the Royal Bengal Tiger, Leopard, Fox, Wolf, Hyena, Jackal, Asiatic Lion, Sloth Bear, Himalayan Black Bear, Spotted Deer, Sambar, Blackbuck, Cinkara, Jungle Cat, Crocodile, Gharial, etc. In future, animals like the Hippopotamus, Zebra, Giraffe, etc., are also proposed to be added to the Park. The Park is also a rescue center for big cats. The controversial T-24 tiger from Ranthambore Tiger Reserve, which was accused for attacking four persons at the reserve forest, has been relocated to Sajjangarh Biological Park for the rest of his life.

As far as animal care is concerned, the Biological Park is equipped with a state-of-the-art veterinary hospital and a round-the-clock doctor and attendants. Both prophylactic and curative measures are adopted for the treatment of wild animals by the veterinary doctor at the hospital there. It is mandatory for the zookeepers to provide a daily health report of each and every animal. The food supplied to the animals is procured as per guidelines determined by the CZAI to ensure that wholesome and quality feed is supplied.

The Park has been able to ensure livelihood to local people by taking up community-based participation. An Eco-Development Committee, named the Upalibadi EDC, is associated with the functioning of the Biological Park. Twenty-five EDC workers from nearby villages are employed in the Park for carrying out works like plantation and gardening, watching and as wards of enclosures, cleaning of holding areas, constructing enrichments, animal teasing prohibition and in golf cart driving. Besides, they run a souvenir shop, cycle stands and maintain the

parking area. The income generated from these ventures is used for giving salary to them.

The park can be visited round the year. The monsoon season is from July to September during which the area becomes lush and green. Since its inauguration in April 2015 till the first fortnight of September, the Sajjangarh Biological Park saw a footfall of 152,997 tourists, both Indian and foreigners, and has been collected a revenue of Rs 4,642,270.

The Udaipur Forest Division has taken up several eco-friendly measures for keeping the Biological Park free of plastics as well make it safe and pollution-free. Measures adopted for a safe and clean environment are like refundable plastic water bottle deposit at Rs 10 per bottle, issue of brown paperbags for eatable covers, cycling facilities, signages with messages and battery-operated golf carts. The feeding areas, tickets counters and all structures are constructed by indigenous materials like slate, rocks and bamboo.

Certain problems – shortage of departmental staff, animal exchange programme due to availability of fewer animals, shifting of animals, selfie menace and in the coordination between the three working agencies – are encountered in the smooth functioning of the Biological Park.

In the long run, this Biological Park will continue to generate awareness and compassion in the society towards wildlife and garner their support for nation-wide conservation efforts. Conservation breeding programmes may also be taken up by the Park in the future. The Sajjangarh Biological Park has a tremendous scope for initiating conservation breeding programmes with global collaborations. Since the animal plan of this Park is commensurate with that of the zoos of Gujarat, Madhya Pradesh, UP and five State zoos of Rajasthan, the entire population can be taken up as a single population and breeding programmes can be taken up. This will help reduce the inbreeding depression among the animals.

The Sajjangarh Biological Park may at some point of time continue to work towards species preservation while playing an effective role in reducing man-animal conflicts, particularly in the urban landscape, at the same time.

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UDAIPUR / RAJASTHAN

Bamboo production and the *Kathori* tribe

The Forest Department has involved the Kathori tribe – given the tribe's traditional knowhow – in giving an impetus to bamboo production in the district

Priyasa Saikia

The topography of Rajasthan is dominated by Aravalli ranges running across the State. The south-eastern part of the State is dominated by uplands east of the Aravalli range. The southern parts are heavily forested and the Aravallis form Rajasthan's most important watershed.

The Udaipur district has a total geographical area of 1,388,255 hectares, out of which land under forest is 397,007 hectares. The reason behind such lush greenery is that the district is towards the windward side of the Aravalli hills and, as such, the locality factors of rainfall and soil quality are greatly blessed. It has been reported by the National Bamboo Mission that 67 per cent of bamboo forest occur in the north-eastern states of India and out of 33 per cent of other States, Rajasthan accounts for 7 per cent of bamboo cover. Most part of the bamboo cover is contributed by the Udaipur district. Bamboo has been predominantly present in the region since time immemorial and the species here mostly is *Dendrocalamus strictus*, followed by quite lesser amounts of *Bambusa bambusa* and *Bambusa arundinaria.* Bamboo is both naturally propagated as well as cultured in the places like Bansi, Kotra, Dhariavad, Banswara, Dungarpur, Jhadol, Devla, etc. The bamboo cultivation and culture has a strong relationship with the tribal culture and livelihood, especially in the tribal belt of Udaipur district.

Bamboo propagation in the district

There has been a massive degradation of the Aravalli ranges due to various natural and anthropogenic causes. Mitigation and control measures have thus been of prime importance. The Aravalli Afforestation Project, which started in 1992-93, had objectives to restore the forest cover in the region and Udaipur district had been an integral part of the programme. Even Bamboo Mission had been taken seriously since the revenue generated had fluctuated over time with certain lapses. The main loopholes of bamboo production in the tribal belt were illegal activities, biotic interferences as well as some

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unscientific harvesting techniques, leading to periodic decline. All these shortcomings have been addressed by the Forest Department of Udaipur district and controlled till present times. As per the National Bamboo Mission (NBM) report, 2010-11 to 2013-14, an area of 135.85 ha has been covered so far under the NBM scheme.

Bamboo plantations and cultural operations

Bamboo propagation is done with the help of rhizome culture, nodal culture and even viable seeds. The propagule is brought from the tribal belt of Udaipur, or even from other States. The nodal propagules are cultured on nursery beds initially. Such vegetative propagules are allowed to remain in the nursery bed till rhizomes develop, which usually requires about one year. After the initial process, the propagules are transferred to polybags and finally transferred to the field in subsequent years.

Cultural operations usually involve managing the clump size and quality. Smaller clumps are easy to manage than larger clumps. But, smaller clumps may result in congestion. However, the same problem may arise even in larger clumps if they remain unmanaged for a longer time. Other techniques used for management were construction of retaining walls around the clump and the subsequent filling up of soil. As bamboo cultivation requires well-drained soil with good moisture retaining capacity, such operations have been found to be beneficial in the district. Dead, drying, diseased and malformed culms within the clumps are periodically removed.

Bamboo harvesting in Udaipur district

Forest compartments are the unit of bamboo harvesting and only fourth year bamboo-culms are harvested (as per rotation period). Bamboo harvesting from the region is conducted usually by the month of October every year and never between April and September in order to avoid the rainy season. The harvesting or decongestion follows a horseshoe pattern. Four to eight culms of two years or more of age are left behind along the periphery. Only sharp tools are used for cutting so as to avoid splits in bamboo culms. A special kind of custom-made axe is used by the Kathodi tribe for the purpose of harvesting in the Udaipur district. Culms lesser than three year old are never felled and clumps having less than 6 culms are not exploited.

Role of *Kathodi* tribe in bamboo cultivation

As has been documented in literature, the *Kathodi* tribe indeed was found to play a very important role in bamboo cultivation and harvesting operations. The *Kathodis* were initially brought from Maharashtra to Rajasthan for extraction of *kathha* from *Acacia catechu* plants. In Maharashtra, the *Kathodi* or *Katkari* tribe has been notified as a Scheduled Tribe. In Rajasthan, they are resident of Kotra and Jhadol tehsils, which are also forest blocks. They were also employed in coal production, teak plantations, furniture-making, etc. Subsequently, they became

specialised in occupations pertaining to bamboo cultivation, utilising their own customary cultivation and harvesting techniques, for which they are sought for even today. A great degree of symbiosis has been noticed between the Forest Department and *Kathodi* tribe within the Udaipur district. Harvesting of bamboo begins from hilltop to valley and the tribesmen play important role in transporting them from field to temporary depot, as well as sizing and stacking of bamboo culms using customary techniques.

Conclusion – a critical viewpoint

The district of Udaipur is a region which is adequately blessed by Mother Nature, bearing a good stock of both naturally regenerated and cultured bamboo forests. Records of 2001-02 to 2013-14 reveal that bamboo plantations of a single species of *Dendrocalamus strictus* fetched a net revenue of Rs 46.66 lakh. The *Kathodi* tribe, with their simple lifestyle and occupational demands, are cooperative with the Forest Department of Udaipur district. The EDCs and Village Forest Management Committees (VFMCs) of bamboo products, *Agarbatti* and herbal-*rangoli* products are running smoothly. Traditional customary practices are also respected by the Forest Department to a great extent. However, it has been observed that the tribal folks are not at all ambitious about livelihood-generation endeavours and remain happy in their niche. It is the role of the Government of Rajasthan and the Forest Department to implement some schemes for enhancement of the VFMC and Non-Timber Forest Produce (NTFP) programmes and practices, conceptualising some customary resource use practices into livelihood generation modes. Such initiatives can foster more sustainability to the existence of the *Kathori* tribe. The most appreciated aspects of the case study was the occurrence of a separate Departmental Operation Division, headed by DCF. Besides, the understanding and awareness of the Forest Department towards the need of tribal cultures and practices is highly appreciable.

Acknowledgement

I convey my gratitude to Dr T Mohan Raj, IFS, DCF (WL), Udaipur Forest Division, Mr V S Rana, DFO, Departmental Operation Division, Dr Satish Sharma, ACF (WL), and Mr S Singh, ACF, for their sincere efforts in facilitating our casestudy tour at Udaipur. I also thank all the forest personnels of Udaipur district who helped us in every way possible.

RAJASTHAN

Phase 2 of the Forestry and Biodiversity Project

The JICA-assisted project has a budget outlay of Rs 1.152 crore and covers 15 districts and seven Wildlife Sanctuaries across the State

Mahamuda Begum

Rajasthan Forestry and Bio-diversity Project (RBFP), is the fifth JICA (Japanese International Cooperation Agency) assisted project in Rajasthan and was started in the year 2011-2012. The eight year project covers 15 districts and seven Wildlife Sanctuaries and has an outlay of Rs 1,152 crores. The project involves activities in the field of Afforestation, Soil and Water Conservation, Biodiversity Conservation, Poverty Alleviation and Livelihood Improvement in the selected villages of the project through active peoples' participation under the Joint Forest Management (JFM) approach.

The Project is being implemented by Rajasthan Vaniki Evam Jaiv Vividhata Sanrakshan Society. The Society forms the state level Project Management Unit (PMU) of the project. The Project Director, RFBP-2 is the ex- officio Chief Executive Officer of the Society and is responsible for the implementation of the Project. He is also the head of the Project Management Unit.

At the lower levels, the Project is being implemented by peoples' body – Village Forest Protection and Management Committee (VFPMC) or Eco-Development Committee (EDC), as the case may be through the existing territorial forest division which is called as the Divisional Management Unit (DMU) of the Project and the concerned Range Office, which is called as the Field Management Unit (FMU) of the Project. A VFPMC/EDC is formed in accordance with the resolutions / regulations issued by the Government of Rajasthan (GoR). Livelihood Promotion activities are envisaged to be undertaken through formation of Self Help Groups (SHGs) from within the members of VFPMCs/ EDCs.

Unlike earlier foreign aided projects there are certain unique features of this project namely :

- It is the first Project to be implemented in Society mode in which Project Management Unit has been registered as a society
- The entire Project is process oriented and lays emphasis on developing and establishing systems and procedures
- **'Village'** is the basic unit and village microplan is the base document for

SFS 2015-17

undertaking various activities under the project

- International and National Consultants have been engaged for technical inputs and assistance on different subject matter.
- NGOs have been deployed by each Divisional Management Unit (DMU) to help in the formation of village forest protection management committee/ eco development committees, formulation of microplanning, mobilization etc.
- For monitoring and evaluation, modern technologies like GIS, GPS, Remote sensing are used

Project Objectives

"To enhance forest area and livelihood opportunities of the forest dependent people and to conserve biodiversity by undertaking afforestation and biodiversity conservation measures through JFM approach thereby contributing to environmental conservation and socio-economic development of Rajasthan".

The Project Area

The entire project area has been divided into 25 Divisional Management Units (DMUs) and 80 Field Management Units (FMUs). The project is being implemented across 10 Desert districts and 5 non-desert districts and in 7 wildlife sanctuaries covering a total of 650 villages. Of the selected villages, 340 are in ten desert districts, 250 are in non-desert districts and 60 villages are in fringe area around the wildlife sanctuaries.

Total Project Village	650 Village
Desert village	340 village
Non-Desert village	250 village
Protected Area	60 village

Desert districts

1. Barmer
2. Bikaner
3. Churu
4. Jalore
5. Jhunjhunu
6. Jodhpur
7. Nagaur
8. Pali
9. Sikar
10. Jaisalmer

Non Desert Districts

1. Banswara
2. Bhilwara
3. Dungarpur
4. **Jaipur**
5. Sirohi

Wildlife Sanctuaries

1. Bassi WL Sanctuary
2. Fulwari K Nal WL Sanctuary
3. Jaisalmand WL Sanctuary
4. Keladevi WL Sanctuary
5. Kumbhalgarh WL Sanctuary
6. Raoli Todgarh WL Sanctuary
7. Sitamata WL Sanctuary

Before the commencement of project activities in a village, its microplan is prepared which is like a village development document that lists out almost all the activities that are necessary for integrated socio-economic development of the village and its inhabitants taking into account the natural, ecological, social, human,

animal and skill based resources of the village. The preparation of microplan is preceded by a Rapir Rural Appraisal (RRA) and Participatory Rural Appraisal (RRA) of the village along with detailed interaction with the villagers, VFPMC/EDC members and local NGOs. The whole exercise is undertaken by partner NGO under supervision of forest officials. PRA methodology helps to identify and prioritize the various needs of the village community. Once approved, the prescriptions made in microplan forms the basis for undertaking project activities in the village. Entry Point Activities (EPA) are also undertaken in the project villages to inculcate credibility and acceptance of project staff among the villagers during initial stage of the project.

Capacity Building is also a very important component of the project of which institutional capacity building is an integral part. A dedicated wing has been formed for Capacity Building which is responsible for capacity building andresearch and training. Trainings are organized starting from the grass root level like VFPMC to the level of DeputyConservator of Forests.The major emphasis has been on VFPMC members and NGOs. These efforts have resulted in timely submission of microplans, proper GPS and GIS data from field, better co-ordination, communication and execution of project activities.

The Project activities have been divided into three phases namely Preparatory, Implementation and Closing.

Activities

1. ***Afforestation:***

Target Area: 590 villages in 10 desert and 5 non-desert districts

Activities: Total area 83,650 ha

Afforestation models have been selected in micro planning process in each village. The demand and supply of fodder and fuelwood, land availability and the vegetation status of revenue and forest lands, the magnitude of damages caused by sand dunes etc., are analysed with participatory rural appraisal.

II. Agroforestry

Target area: 590 villages in 10 desert area and 5 non-desert areas

Activities: In both desert and non-desert areas

- Raising seedlings by Self Help Groups (130 SHGs)
- Training to Self Help Groups (130 SHGs)
- Selling seedlings to villagers

III. Water Conservation Structures

Target area: 590 villages in 10 desert area and 5 non-desert areas

Activities:

❖ **In Non-Desert area**

- Anicut type 1 (600 nos.)
- Anicut type 2 (400 nos.)
- Check dams (200,000m^3)
- Contour bunding (500,000 row metres)
- Silt detention structure (300 nos.)
- Gabion structure (500 nos.)

❖ **In Desert area**

- Percolation Tank (700 nos.)
- Renovation / restoration of

Afforestation model	Applicable land characteristics	Products
Desert Area 56,650 ha		
Canal side plantation(1650 ha)	Forests land along the canal	Fodder /fuelwood/Timber
Sand dune cum pasture development (25,000 ha)	Sand dune in forestry /community private lands	fodder
Silvi-pastoral plantation (25000 ha)	Degraded community/ forest lands	Fodder/ fuelwood
Block Plantation (5000 ha)	Forest land allocated for fuelwood production in irrigation villages and suitable community lands	Fodder /fuelwood/Timber
Non Desert Area 27,000ha		
Fuelwood plantation (10,000ha)	Degraded community land	Fodder /fuelwood/Timber
Rehabilitation of degraded forest- I (2500ha)	Forest land , forest cover 0-20%, water conservation required	Fodder /fuelwood
Rehabilitation of degraded forest- II (2500ha)	Forest land , forest cover (20-40%), water conservation required	Fodder /fuelwood
Assisted natural regeneration (2500 ha)	Forest land, forest cover (0-20%),water stock available, less need for water conservation	
Productivity enhancement operations (2500 ha)	Available bamboo/availability of sufficient growing stock of important species	Bamboo/fodder/fuelwood

traditional water harvesting structure (200 nos.)

IV. Biodiversity Conservation

Target area: 60 villages in the 2 km fringe areas of 7 sanctuaries.

Activities:

- Drainage line treatment works (12,000 ha)
- Development of Water points (100 nos.)
- In- Situ Conservation of germplasm- Great Indian Bustard in Desert National Park, Jaisalmer and Four Horned Antelopein Kumbhalgarh and Sitamata Wildlife Sanctuaries
- Creation of Machia Biological Park, Jodhpur
- Development of Biological Parks- Sajjangarh Biological Park Udaipur and Nahargarh Biological Park, Jaipur

V. Community Mobilisation

Target Area: All 650 villages

Activities:

- VFPMCs / EDC Formation and strengthening
- Microplanning
- Construction of Meeting Centre for VFMPCs/ EDCs
- Entry Point Activities

- Communication Extension and Training (CET) Activities

VI. Poverty Alleviation and Livelihood Improvement

Target Area: All 650 villages

Activities:

- Formation and selecting SHGs (1,950 SHGs)
- Capacity building
- Encouraging livelihood activities of SHGs through loans
- Technical training and skill upgradation of SHG members
- Development of eco- tourism sites
- Support for marketing and value addition

VII. Institutional Capacity Development

Target Area: All 650 villages

Activities:

- Training of forest department staff
- Training of VFPMC members
- Exposure visits of forest officials and VFPMC members to other states
- Overseas study tours of officers
- Overseas training of officers

Fund Flow

Every year the budget is prepared by the PMU and gets sanctioned by finance department, Govt. of Rajasthan through the office of the PCCF. Funds are transferred to the bank account of Rajasthan Vaniki Evam Jaiv Vividhta Sanrakshan Society (RVJVSS) from time to time. The funds are then transferred to the bank of DMUs as per allocation decided by PMUs for carrying out various project activities. As per agreement signed with JICA, after closure of every financial year the accounts are audited and audit certificate issued by Chartered Accountant is sent to JICA.

Monitoring and Evaluation

Impact of afforestation activities are to be evaluated by survival rates of planted trees and improvement in tree cover. Survival rates are evaluated by three methods; regular evaluation at DMU/CCF/PCCF levels, post- project evaluation at PCCF level, and external evaluation by an external organization during mid-term and post – project evaluations. Change in forest cover is analysed by the GIS cell of Rajasthan Forest Department by comparing the satellite imageries of 0th year, 4th year and 7th year after tree planting. Other activities of the Project like water conservation structures biodiversity conservation and other processes associated with project are also evaluated.

Current status of the project

- **Afforestation** : Planting has been completed in 32,382 Ha
- **Cumulative expenditure** : INR 353 Crores
- **SHG formation and IGA** : 800 SHGs

- **Biological Parks**
  a. Sajjangarh (Udaipur) - Operational.
  b. Machia (Jodhpur) - To be operational soon.
  c. Nahargarh (Jaipur) - To be operational by March 2016.

Advantages of Externally aided Funds

- It creates additionality of resources
- International agencies insist upon proper documentation of project proposals followed by mid-term evaluation and a final evaluation.
- Identifies and pinpoints the shortfalls that occurred as well as the problems faced in the implementation of various earlier projects.

Drawbacks

- A larger number of externally aided projects leave very little money for other activities in the field.
- There is a feeling that the total money itself has not increased in the development budget but a great deal gets spent on consultancies especially involving foreign experts
- There is more emphasis under EAPs on achieving immediate success rather than on sustained gains
- Foreign money is seen as easy money and the Governments do not undertake a close scrutiny of the projects prepared by the consultants, with the result that the projects end up deepening the dependency syndrome.

Acknowledgements

I would like to extend my sincere gratitude to Mr (Late) A K Uadhyay (IFS), former PCCF, Rajasthan Forest Department, for his constant guidance, support and motivation during our case study tour. I am also very grateful to Ms Kavita (IFS), CF, Mr M K Agarwal (IFS), DCF Jaipur North Forest Division, for extending their constant help and support. I would also like to acknowledge the staff of Jaipur Forest Division for their valuable inputs, efforts, and care.

KEOLADEO NATIONAL PARK / RAJASTHAN

Challenges in managing water for the National Park

The Forest Department has taken many steps to mitigate the water scarcity problem and have been successful to a large extent

Ritu Paban Borah

It is often said that 'water is life'. For Keoladeo National Park in Rajasthan it is everything. It is the water that makes the wetland wet, supports grasses, a vast number of fish and indeed the rich avifauna which is dependent on them.

Managing water for the Park is not an easy task for the park authorities and locating a reliable source of water is the biggest constraint. It needs to be mentioned here that the Park is an artificial water body built by Maharaja of Bharatpur, where they used to shoot ducks for recreational activities. The main sources of water for the Park are Ajan *Bund*, Dholpur-Bharatpur Drinking Water project, and Govardhan Drain Project.

Ajan *Bund* is the oldest source of water, however, due to increase in height of Pachna Dam in the upstream of the Gambhirriver, the supply of water from Ajan *Bund* has gone down drastically. Seeking a solution after appeal from various concerned authorities of the Park, the Hon'ble Supreme Court with the suggestion of the Central Empowered Committee, instructed that water be released for the Park from the Dholpur-Bharatpur Drinking Water project. The project of the State Public Health Department was given Forest Clearance and the much needed water was supplied to the Park.

Govardhan Drain Project was designed to drain out flood water at Rajasthan-Haryana Border to River Yamuna. A diversion was created for the intake the flood water. It is worth mentioning that the Planning Commission had released 56 crore rupees to build a pumping station at Goverdhan Drain and also a dedicated 17 km underground pipeline was laid to draw water from the drain to the park during rainy season.

Solar power driven pumps have been installed inside the park to meet the water demand when required. Water from solar pumps supplement the water availability during the summer when the park is almost dry, this helps the fishes and turtles to survive in water pools. The water in managed in the blocks of the park by operating the sluice gates. However in spite of arranging for water inside

ACF Trainee, CASFOS, Dehradun

the park, there are a number of issues that the park authorities have to deal with. Some of the issues that the park faces and has mitigated to an extent are invasion by *Prosopisjuliflora*, removal of water hyacinth, management of grassland and removal of African catfish (*Clariasgariepinus*).

Prosopisjuliflora that invade the wetland are uprooted by the Eco-Development Committee. This has dual benefits – control of the invasive species and supply of timber to the villagers. Water hyacinth is manually removed with the help of boats and piled up in a place for decomposition. Excessive growth of grass is not good of the health of the wetland. It may act as a catalyst in the succession of a wetland into woodland. This is managed by manual cutting, controlled burning and surface scrapping during the dry seasons.

In the case of the African catfish it was notices that these fishes feed on other fishes and even sometimes on the aquatic birds. This was brought to light through dissection of the African catfish. In order to control its population, fishermen were hired to catch them. Rickshaw pullers and staffs were also involved in this process. The catch was sent outside the Park. However, since legally nothing could be sent out of the Park, a different and amicable solution was found and resorted to subsequently. The catch was discarded inside the forest and served as food for the two species of vultures that are resident in the Park – King and Egyptian Vulture. The operation is generally carried out in the month of June and during this time jackals have young ones. So the discarding of fish didn't cause any problem and also supplemented the jackal population.

The Keoladeo National Park is a Birds Paradise due to its rich avifauna, it is also due to the dedicated efforts of the foresters of the National Park.

Acknowledgement

I would like to express my sincere gratitude to Mr Biju Joy, IFS DCF(WL), Biologist Mr Bholu Abrar Khan and all staff of Keoladeo National Park (KNP) for providing valuable information and support.

RANTHAMBORE NATIONAL PARK / RAJASTHAN

Management of Trinetra Ganesh Chathurti Mela inside the Protected Area

Nearly 3 lakh pilgrims visited the Jogimahal Fort inside the Ranthambhore Tiger Reserve in 2015 for the annual Ganesh Festival, making the crowd management a humungous task

Hibu Tana

Trinetra Ganesh Chathurti Mela has been celebrated in Joghimahal Fort inside the Ranthambhore National Park since time immemorial. Speciality of the temple is that all five deities – Lord Ganesha, his two wives Bhudhi and Shiddhi, alongwith their sons Subh and Lahb – were found in a monolith that naturally came out in the fort.

Joghimahal Fort is located inside Critical Tiger Habitat (CTH). The total area of Ranthambhore Tiger Reserve (RTR) is 1,400 sq km and demarcated area for CTH is 1,100 sq km. The festival was celebrated for three days in 2015, from September 15 to September 17. There are several other temples inside the Tiger Reserve, like Soleswar Mahadev, Amareshwar Mahadev, etc. The total distance from Sherpur main entry gate in the Protected Forest till the temple is 4 km. Last year, in 2014, the total number of pilgrims was around 10 lakh. In 2015, it was around 3 lakh – the number dipped due to hot weather and delayed monsoon. Most of the pilgrims were from nearby villages and some were from Madhya Pradesh and Maharashtra. The control and management of so many people in the CTH in such a short duration poses a huge challenge to the Forest Department. It takes cooperation and coordination of different agencies and departments to make such an event successful.

Different agencies and government departments involved during the *Mela* were:

- Local MLA
- District administration, Sub-Divisional Magistrate (Mela).
- Rajasthan Police
- Home Guard (Rasthriya Grah Rakshak Dal).
- Rajasthan State Electricity Board
- Medical department
- PHED
- PWD
- Forest
- Archeological Survey of India
- Ganesh Mandir Trust
- Department of Pilgrims (Devstan Bhibhag)
- Nature guides
- NCC
- NGOs like ATREE, ARC, Kids of

Officer Trainee, Batch 2015-17

Figure: **Map of Ranthambhore Tiger Reserve**
Courtesy: **Dr Dharmendra Khandal, Manager, Tiger Watch**

Figure: **Road kill: dead scorpion**

Tiger, Tiger Watch
- College and school students

Environmental concern and disturbances

The progressive growth of the *mela* over last two decades results in overcrowding on the forest habitat and its water bodies. Major concerns were the menace of polythene and plastic waste inside the RTR, littering and garbage, especially at free-food points (*bhandaras*) and drinking water points, problem of bathing and defecation, noise levels, and effects of all these on the flora and fauna, as well as man-animal conflict. The plastic waste collected in 2014 was 125 gunny bags and in 2015, 46 large gunny bags inside the Protected Area.

Management by Forest and other departments/ agencies

The total strength of staff on duty was 92, out of which 33 were from the Forest Department. The staff on duty was directed to be in a uniform, with wireless handsets, raincoats, torches, batons, helmets, etc. Nature guides were instructed to be stationed near water bodies like Rajbagh, Padam, etc., on rotational basis. Further, the staff was divided into groups of 3-4 members as animal rescue team with tranquilisers; snake handlers 2 groups; mobile squads 3 groups; and, foot-patrolling groups, standing guard near water bodies and 4 entry points –Sherpur Main Entry Gate (Ganesh Gate), Jogi Mahal located at the foot of Ranthambhore Fort, Soleshwar Mahadev, and Badal Gate, the southern entrance point – as well as at the small grass lane. All were instructed to have first-aid kit with them and at least one swimmer, either from the Forest Department or the Home Guard.

Tiger Project Area, like Balaji and Amershwar, were barricaded. A thorny bush fencing was made on the wall to check the movement of animals into the pilgrimage route. Announcements were made at regular intervals at the main road from Sherpur Gate to Jogi Mahal Gate. All vehicles entering into the Protected Area needed a permit from the Mela Magistrate. Banners were put up warning pilgrims of dangers from Tigers, Leopards and Snakes inside the forest and from Crocodiles in the water bodies. The banners also gave information about provision of clean and treated drinking water from tube well, stream and ponds, one at Sherpur Gate and other at Jogi Mahal Gate as approved by the Chief Medical Health Officer. Toilets were opened for public with fee of Rs 5, which was to be given to sweepers. The mobile sound system and DJ were located outside the Protected Forest Area.

Facilities that were availed by various departments and organisations were electricity, free drinking water facilities and medical facility in case of emergency. The Forest Department staff kept a watch on some young pilgrims who tended to move inside the restricted area. This was to prevent man-animal conflict. The main function of the Police, Home Guards and NCC members were to keep the crowd

Figure: **Illustrative Awareness Tools: Banner, Hoardings, Poster**

moving continuously so that the traffic was smooth.

A signature campaign was also started and its major outcome was that top district officials, influential citizens and civil society members became aware of the campaign.

Cleanliness and hygiene

Volunteers from NGOs and student bodies like Akhil Bhartiya Vidyarthi Parisad were distributing cloth bags made from old sarees while collecting polythene bags, and were sweeping and cleaning waste in the Protected Area. The volunteers manned following locations:

- Main (western) entrance to RTR – Sherpur Gate (Ganesh Gate)
- Jogi Mahal at the foot of Ranthambhore Fort/ Trinetra Ganesh Temple and where the *parikrama* also starts
- Soleshwar Mahadev, a Shiva temple inside RTR where devotees go to after visiting the temple
- Badal Gate, the southern entrance point to RTR near Soleshwar Mahadev area.

Frisking and confiscation of tobacco product like *gutka, beedi* and cigarettes was simultaneously conducted by NGO volunteers, alongwith ATREE-ARC team and a girl's team. Temporary urinals were constructed on way to the temple by the Archaeological Survey of India (ASI).,. The children of Mogya

Figure: **Large bags of polythene recovered**

Figure: **Dustbin by Forest Department**

Figure: **Urinal built by ASI**

Figure: **Temporary dustbin for the occasion**

tribe – a sub-tribe of Pardhis with hunting skills and involved in poaching earlier – who are being rehabilitated by the Tiger Watch education programme, enthusiastically participated in the religious festival and conservation protection volunteer programmes.

Observations

A significant numbers of larger animals avoided the temple and adjoining core area during festival due to following reasons:

- Lights at night till morning.
- Noise by generators and devotees, like shouting slogans and devotional songs.
- Continuous movement of devotees. Camping in the forest indicated that large numbers of small animals were killed by night traffic. Trees in the camping area inside the forest and in the strips along the road suffered from lack of regeneration as new

Figure: **Trash collected near Sherpur Entry Gate**

Figure: **Plastic waste during the *mela***

Figure: **Burnt patches at the roadside after the *mela***

saplings were trampled upon.

- There are around 50 Tigers in the RTR and each Tiger's dwelling area is about 30 to 50 sq km. So, if we divide the total area of RTR by average dwelling area of tiger, the bearing capacity comes to 35 tigers. Thus, the RTR was overpopulated, which could also be a reason for the man-animal conflict.
- Only one medical camp was there for around 3 lakh pilgrims.
- The urinal was only at the area near the temple.
- As there was insufficient number of toilets, the pilgrims often resorted to open defecation in jungle, which not only polluted the streams and rivers but also increased the chances of man-animal conflict.

However, forest officials were very efficient and cooperative with other departments and agencies in promoting the "Clean Ganesha and Green Ganesha" concept. On subsequent days when I visited the Protected Forest Area, it was clean and free from plastic. But, on the highway, we could see some burnt patches and it was obvious that the polythene was burnt in open.

Reference

'*Sustainable green religious tourism, Ranthambhore Tiger Reserve: An emerging model with multi-stakeholder engagement*' by the Ashok Trust for Research in Ecology and Environment and Alliance on Religions and Conservation

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UDAIPUR / RAJASTHAN

Human-Leopard conflict on the rise

There is an urgent need for broad policy guidelines and management options to effectively deal with the increasing problem of man-leopard conflicts

Bikram Singh Rongpi

On September 18, 2015, hundreds of villagers mercilessly beat a leopard to death at Rela Ka Baidya village in Bhilawara district. This was in retaliation against the leopard, who had reportedly attacked 10 people on two consecutive days. "Its stomach had burst and intestines had come out. If it would have been rescued, we could have known whether the panther was rabid, since it was reported to be chewing whatever came before it," said B P Pareek, Deputy Conservator of Forest.

There were 11 such incidents of human-leopard conflict in Udaipur district of Rajasthan over the past two years (2014-2015) and the number of such conflicts is likely to increase in future because leopards have highly diversified diets and are extremely adaptable to various ecological conditions. This versatility allows them to thrive in a broad range of habitats, often bordering on human settlements. However, the Indian law prohibits the killing of Schedule 1 species, which includes Leopards. Therefore, responses have been confined to removing the animal to captivity, or translocating it to a new area.

The incidents of leopards straying into settlements causing human casualties and retaliatory killings of leopards by the public have been on the rise in Udaipur district due to

Leopard killed by villagers at Rela Ka Badiya village

A woman killed by the same leopard in Rela Ka Badiya village

Officer Trainee (2015-17 Batch), CASFOS, Dehradun

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शहर से करीब 20 किमी दूर रामा गांव में रविवार सुबह कुएं में एक मादा पैथर व मोरनी मृत मिली।

दोनों को पास ही रहने वाले ग्रामीण लालूराम गमेती ने देखा और वनविभाग को सूचित किया। उप वन संरक्षक, उत्तर ओपी शर्मा ने बताया कि विभाग की टीम सूचना मिलने पर घटनास्थल पर पहुंची। वहां हालात को देखते हुए लगता है कि मादा पैथर संभवतया शिकार के लिए आई होगी और मोरनी का शिकार करने के दौरान दोनों ही बिना मुंडेर के कुएं में गिर पड़ी। इससे दोनों की ही डूबने से मौत हो गई। कुएं के पास ही मोरनी के अंडे भी मिले हैं, जिन्हें बायोलॉजिकल पार्क भिजवा दिया गया है। शर्मा ने बताया कि मादा पैथर मात्र एक या डेढ़ साल की थी। दोनों का पशु चिकित्सालय में पोस्टमार्टम कर सीतामाता नर्सरी में अंतिम संस्कार किया गया।

डूबने से हुई मौत : मेडिकल बोर्ड

पशु चिकित्सालय के उपनिदेशक डॉ. ललित जोशी ने बताया कि मादा पैथर के शव का डॉ. सुरेश जैन, डॉ. हिमांशु व्यास व डॉ. हंसकुमार जैन के मेडिकल बोर्ड ने पोस्टमार्टम किया। बोर्ड ने पैथर के फेफड़ों में पानी भरा पाया। इससे [illegible] से उसकी मृत्यु होने की पुष्टि होती है। पैथर की उम्र करीब डेढ़ [illegible] इसी तरह मादा मोर की भी डूबने से मृत्यु हुई। वह दो-ढाई [illegible] अधिकारियों ने बताया कि कुएं के समीप मोरनी के अण्डे देखे गए। [illegible] वहां बैठी होगी और मादा पैथर ने उस पर झपट्टा मारा होगा। [illegible] और मोरनी दोनों कुएं में गिरकर डूब गए। दोनों 24 घंटे [illegible] गल चुकी थी।

Photo of leopard and peacock drowned in a well

anger and fear. The leopards' presence has been increasing in a wide range of rural and built-up environments. These are far away from their natural habitat and Protected Areas due to habitat disturbance and increased human encroachment on leopard habitats, which leads to the decline of natural prey species. As a result, leopards prey on humans, dogs, cows, goats and other domesticated animals. In areas where there is scarcity of water, the leopards come out of their natural habitat in search of water, thereby making the human-leopard conflict inevitable in Udaipur district. Under such circumstances, the Forest Department is the first to face the heat of public reaction and requires the goodwill and confidence of the rural community much more than other government departments.

The efficacy of capture and translocation of leopards from conflict areas as a mitigation measure is increasingly being questioned as there is no available habitat. Scientific research shows that when a leopard is displaced, it has the tendency to seek out its original territory which may be hundreds of kilometres away. In this process, the leopard often runs into numerous villages and agriculture fields and causes more problems for which it had previously been caught. This has necessitated the need for having broad policy guidelines and management options to effectively deal with this gradually intensifying problem across the country.

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JODHPUR / RAJASTHAN

Machia Biological Park: From a rocky desert to a home for wildlife

The vision of the Machia Biological Park is to create an opportunity for the citizens of Jodhpur to have a biological park very close to the city

Elangbam Nirmala Chanu

The Jodhpur Zoo was established by Maharaja Umaid Singh in 1935. The Zoo is situated within the premises of the "Public Park" popularly known as Umaid Udhyan, Jodhpur. Within the Umaid Udhyan area are also located the 'Public Library' named "Sumer Sarvajanik Vachnalaya" and the museum named "Sardar Sangrahalaya". Post-Independence, the management of Umaid Udhyan and the Jodhpur Zoo (situated within) was entrusted to the Superintendent, Garden Department of the Govt. of Rajasthan. Subsequently the management of Jodhpur Zoo was transferred from the Garden Department to the Forest Department in 1956. Since then Jodhpur Zoo is being managed by the forest department of Rajasthan Government.

Jodhpur Zoo was later given the status of Heritage zoo by the Central Zoo Authority (CZA). However since the zoo could not fulfil the requirements

Rhyolite stone

SFS OT 2015-17 Batch

Double blasting technique of planting in hard Rhyolite stone

of a modern zoo, the CZA refused to grant permission. To resolve the issue, CZA decided to give recognition only on the condition that a new satellite zoo would be constructed at Machia as per their guidelines. Thus, the decision for the creation of Machia Biological Park, a modern zoo, was made for the wild animals in the Jodhpur Zoo.

The vision of the Machia Biological Park is to create an opportunity for the citizens of Jodhpur to have a biological park very close to the city. This would offer not just an opportunity for the residents of Jodhpur to view wild animals, but would help in educating and sensitizing them and build empathy towards wild animals among the people. The biological park will also serve as a gene pool for future biological research on wild animals and will facilitate studies on behaviour and breeding of different animals. It also offers space for captive conservation and breeding of endangered species of wild animals.

Machia Biological Park was conceptualized in the year 1982-83. It is located 8 kms away from Jodhpur railway station on the western side of Jodhpur. It is the satellite zoo of the old heritage zoo of Jodhpur. Machia Biological Park is spread over 41 ha out of the 604 ha area in Machia Forest Block. The legal status of Machia forest block is of a protected forest notified vide notification No. II9(6) forest/90 dated 01-07-1990 under the Rajasthan Forest Act 1953.

The area is in the biological park

Changes from rocky desert to lush green micro-environment

is mainly rocky composed of rhyolite – an igneous rock. The terrain in the park is undulating and it has numerous man made water bodies. This area has poor soil quality and if soil is present has low soil depth. The natural vegetation in Machia Biological Park is dry scrub forest consisting of scanty tree cover of species like *Acacia senegal*, *Prosopis cineraria*, *Prosopisjuliflora*, *Capparis decidua*, *Zizyphusnimmularia*, *Commiphorawightii* etc. This zone receives low rainfall as a result of that vegetation is scarce.

Plantation techniques

Prior to 2009, plantation activity was started by making a loose stone structure of 20 cm width. The depth / height of this structure was around

100 cm and diameter was 60 cm. This was filled with a mixture of sand and manure in the ratio of 4:1. Species selected for plantation were *gular*, *neem*, *peepal* and *bargad* of approximately 3-4 feet height for planting. The plants now have attained a height of 10-12 feet during the last 5 years.

Due to the low success of survival as well as growth in the plantation method, a new technique for plantations was adopted. Known as blasting, this technique uses blasting material to create pits. The reason for adoption of this technique is the fact that rhyolite is 5 to 7 times harder than sandstone. Both single and double blasting methods are used depending on the suitability of the area. First a 1m x 1m site is selected and blasted (single blasting) and the rubble and broken rock material are removed. The pit is filled with a mixture of sand and FYM in the ratio of 4:1 and 2-3 years old planting stock are planted. In the double basting technique the pit is reblated making a depth of about 2 m. Material generated by double blasting is left as such to provide the enough space for the soil and roots of plants to penetrate into the rock crevices.

The plant species planted are *Ficusbengalensis, F.glomerata, Pongamiapinnata, Bauhinia spp., Anogeissusrotundifolia* etc. This technique has been very successful providing suitable condition for plants to grow in such harsh condition. The efforts of workers and proper utilization of water resources in irrigation also plays a major role for the successful growth. The rocky desert has now been converted into a lush green forest. The forest department has an aim of planting 7500 trees inside the park in order to completely change the microclimate of the area which will be friendly to the wild animals as well as for visitors.

There are 20 enclosures out of which 12 enclosures have already been constructed. All the enclosures are constructed in such a manner that it provides a natural ecosystem to the wild animal and is also approved by the CZA. Since the temperature in the area crosses 45°C during summer season, special consideration has been given to the construction of shelters for animals. Unbaked bricks and mud is used for the construction and provides more ventilation and a cooler shelter. Since there is problem of rodents in the area, all the enclosures are provided with a rodent proof fence.

The landscaping of the park is picturesque with a view of Kaylana Lake. It has a lotus garden,well maintained lawns, places for resting set amidst lush green surrounding. The park has also provided employment to women as zoo keepers and landscaping work like lawn maintenance.

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RANTHAMBHORE TIGER RESERVE / RAJASTHAN

Tiger monitoring with camera traps

The camera trap method of monitoring tigers provides a more reliable count than the earlier pugmark method and is being used the Ranthambhore Tiger Reserve

Leishangthem Jeeceelee

Ranthambhore Tiger Reserve (25° 41° N to 26° 22′ N and 76° 16′ E to 77° 14′ E) is situated in the western bank of river Chambal, in the south-eastern part of Rajasthan in Sawai Madhopur and Karauli districts. The total area of Ranthambhore Tiger Reserve is 1700.22 sq km, out of which 1113.36 sq km has been notified as critical tiger habitat and 297.92 sq km as buffer area. The RTR constitutes Ranthambhore National Park, Sawai Madhopur Wildlife Sanctuary, Sawai Mansingh Wildlife Sanctuary in Sawai Madhopur district and Keladevi Wildlife Sanctuary in Karauli district. It represents the western most distribution limit of the tiger species (*Panthera tigris tigris*) in India and has semi-arid climatic conditions, receiving an average rainfall of 800 mm per annum. Forest type is typical representative of dry-deciduous *dhok* (*Anogeissus pendula*) forest. The floral vegetation of the tiger reserve is tropical dry deciduous forest and tropical thorn forest.

Tiger, being the charismatic large carnivore top predator, serves as the flagship species for conservation of biodiversity. However, its startling decrease in number in late 1960s led the Indian Government to formulate an action plan to save tiger from imminent extinction, and subsequently led to the emergence of Project Tiger, a blueprint for India's tiger conservation programme. RTR was one of the first nine wildlife areas selected as Project Tiger Reserves. Monitoring of tiger, therefore, has become necessary to study the relevant holistic, ecological and socio-economic aspects addressing important issues like population dynamics, demography, territory size, dispersal, food habits and response of introduced tigers to anthropogenic disturbances. Since 1970s, the pugmark census monitoring techniques had been used to conduct all-India tiger census every four years. During the census, the information obtained was pugmark tracings, plaster casts and gait measurements, additional information on location, date, and substrate. Subsequently, individual tigers were identified based on the above information. Individual tigers were continuously monitored over time and total count in an area was arrived at. However, in recent decades, the reliability of pugmark census monitoring techniques had been questioned.

ACF Trainee, CASFOS, Dehradun

The Tiger Task Force, constituted by the National Board for Wildlife (2005), has formulated the revised methodology/approach propounded by the National Tiger Conservation Authority (NTCA) and the Wildlife Institute of India (WII) for country-level estimation/monitoring of tiger/prey status and its habitat. Following directions of the NTCA, the Phase IV management-oriented monitoring in Ranthambhore Tiger Reserve has been carried out since 2011 annually. The process involves double sampling in a statistical framework, which allows extrapolation and rigorous statistical analyses. It is far more accurate than the pugmark method. It is conducted in three phases: ground survey, analysis of satellite data and camera trapping.

- **Phase-I:** Ground survey data collection at beat level on signs of tigers, co-predators, prey and habitat status following a standardised protocol – indirect survey by field personnel.
- **Phase-II:** Statistical and satellite data analysis.
- **Phase-III:** Camera trapping conducted by research biologists, individual tigers identified by their unique stripe pattern.

Camera Trap method: The whole reserve is divided into 1.41x1.41 km grids and a reconnaissance carnivore sign survey is carried out in each grid. The camera trappings grids are selected based on presence of indirect signs of the tiger such as scats, scrapes and pugmarks, etc. The staff of respective beats within the sampling grids is consulted to get a clue of the most extensively used trails of tigers, such as those near a source of water. The location of recording of indirect signs are marked using a hand-held Global Positioning System (GPS). These locations are overlaid on the map of the grid to determine the spatial spread of trap sites and spatial coverage of the area, especially to detect large gaps without trap sites.

In Ranthambhore National Park (RNP) and adjoining area, 185 camera trapping grids were installed and both side camera traps were deployed in each grid. The camera traps were installed usually along a trail, small creek or near a water hole where the chances of sighting animals are high. The sites are required to be clear of bushes and grass so as to provide no obstacles while taking pictures as the camera works on the motion sensor. Cameras are usually installed at knee-height. The camera trapping stations outside RNP are identified on the basis of movement of tiger and are marked on the field with station number written on it. The list of camera trapping stations along with GPS was handed over to concerned Range Officers and Foresters for reference. These camera trapping stations would be used year after year for tiger estimation in Ranthambhore Tiger Reserve.

A Monitoring Cell is maintaining regular tiger movement records and photo database of tigers. Tigers are being identified by comparing their stripes. No two tigers have similar stripes. The cell coordinates with range forest officers. The database of the information on tiger photo data, habitat

status, other co-predators and ungulates are maintained using a software, 'Tiger co-predators, prey and habitat status Data Entry System'.

The camera trap method of monitoring tigers provides a more reliable count. Camera traps are useful tools for studying the ecology and behaviour of elusive animals and also helps in the detection of dispersal routes of animals in the semi-arid landscape. The data is important for making conservation and management decisions.

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Note: Articles may be sent at the following email ID:
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Evaluation and Review System

There will be two layers of review of the contributions; Faculty and the Directorate review. Evaluation and review at the faculty level in the training institutes/academies will be undertaken under the guidance of Director/Principal/Head of the institutions. Even very specialized and technical topics shall be presented in simplified format so that frontline staff and forest community are able to appreciate and understand the topics. Articles shall be written in a popular style, easily understandable and in simple English.

However depending on the response to this programme, arrangements can be made for translation of the magazine into the vernacular. A short note about the contributor and the reviewer shall accompany the article. The note shall contain name, age, postal and e-mail address, course, academic accomplishments, and important assignments held. The evaluation would be done on following criteria:

a. **Style**: The article should be interesting and informative. The introduction should draw the reader in and convince them that the remainder is worth reading. The remaining should be written in a lively and concise style, and should leave the reader convinced of the importance of the topic.
b. **Structure**: The article should be within 1000 words, and formatted in 1.5 line spacing in Times New Roman 12 point font.
c. **Organization**:
    - Instead of an abstract the article will give information on the location, the period when the field work was carried out
    - Integration - the article organized in a coherent form and all ideas are clearly leading to a single main argument.

The review at the Directorate level will be done through an editorial board constituted by the DFE, which will be responsible for the content, design and review of the journal articles. The editorial board shall consist of expert/experts constituted by DFE and reconstituted every year, which would screen contributions and recommend their publication. Articles previously published elsewhere, or simultaneously sent for publication elsewhere, may be accepted with modifications. Article submitted shall carry a declaration that the article is original. The Editor would reserve the right to reject articles without assigning any reason and articles not found suitable will be sent back.

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