

Hydrological, agricultural and environmental surveys of Lava and Rishop: Two ecologically important hamlets of North Bengal, India

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INTRODUCTION:

- 1. Forest cover in hills is essential to maintain environmental, economic and ecological balances. North Bengal accounts for 3,086 sq km (26 %) of the 11,876 sq km area of classified forests in the state, and for nearly 5,000 sq km (40 %) of all land under tree cover.**
- 2. Lava ($27^{\circ}5'4''$ N $88^{\circ}39'57''$ E) is a small hamlet situated 34 km. east of the Kalimpong subdivision (27.06° N, 88.47° E) in Darjeeling district (27.3° N, 88.16° E) of the state of West Bengal, India. Lava is situated at an altitude of 7,016 feet (2,138 m) in the foot-hill of the Himalayas.**
- 3. Lava is the gateway of Neora Valley National Park, a virgin, unexplored terrain in the Himalayas.**



4. Another beautiful small hamlet Rishop, which nestles amidst the hidden hills of Neora Valley is around 9 km. from Lava.

5. Lava has now become a favorite tourist destination for people living on the coast of West Bengal, and tourism has become the most important source of living for the inhabitants.



6. The main objective of the present research work was to construct the Hydrological, Agricultural and environmental framework of the Lava and Rishop area and to highlight the proposals for sustainable management policies of those ecologically sensitive zones.

METHODS OF THE SURVEY WORK:

- **The study was done in April, 2014 by visiting Lava and Rishop and the primary data were gathered through field survey and direct contact with common people and authorized centers of the region.**
- **Information on agricultural activities is collected from the local villagers. Report on the silviculture unit (hills) of Lava was prepared based on the information displayed there and the names of the chemicals used in the cultivation were collected from the chemical stocks kept in the unit.**
- **Information regarding the transport system was collected from the local transport office and syndicate.**
- **Information on environmental activities like using rainwater harvesting structures and waste management policies is collected through surveys in the villages and from the local hotels situated in Lava and Rishop.**
- **Biodiversity was observed by visiting the Neora Valley National Park and the Neora Valley Nature Interpretation Centre situated at Lava.**
- **Pictorial documentation was done in every phase of study.**

Water Management:

- The main source of water in Lava is the Neora River situated in the Neora Valley National Park. Long pipelines are constructed from the water source to Lava, water is distributed through pipes.
- There is periodical water crisis in Rishop, mainly in the dry seasons. 14000 feet long pipe is used for bringing and distributing water in the region.
- The roofs of many hotels, resorts and houses of Rishop have aluminium gutters at the corner for collecting rainwater. The roofs have inclined slope, so that water flows easily in the gutter. Pipes are connected with the gutters through which water can be collected in the cisterns and containers.
- The collected rainwater is used for bathing, washing and irrigation purpose. For drinking purpose, the people depend on the supplied water.



WASTE MANAGEMENT:

- In Lava, the people used to burn the waste materials in a specific empty place once in a week.

In Rishop, every hotel has their own burning place where they used to burn all the waste materials once in a week.

- The people of Rishop used to bring the fuel wood from the forest area after taking permission from the government.
- Usually the rotten and low quality woods are used for burning purpose.
 - The students and teachers of Lava Monastery used to collect waste materials from the nearby villages twice a year and dispose the wastes properly.
- “No plastic zone” is marked at the Nature Interpretation center and the Zero Point of Neora Valley National Park.

AGRICULTURE, HORTICULTURE AND LIVESTOCK:

- In Lava, the common cultivable edible plants are rice, ginger, cauliflower, cabbage, beans, radish etc. In Rishop, the common edible plants are maize, green peas, potatoes, cauliflower, cabbage, tomato, garlic, coriander etc.
- In both regions, organic cultivation is done by using cowdung and jungle soil (rich in organic matter and micronutrients). In Rishop, no synthetic fertilizers or pesticides are used in cultivation.
- Large Cardamom (*Amomum subulatum*) is cultivated in Rishop, however, in recent times, the production has been severely affected by the shortage of water (according to local reports).
- Some houses in Lava and most of the houses in Rishop have cultivable lands adjacent to the houses and farming is done there. In Rishop, many medicinal plant varieties are cultivated in the villages.
- In the villages of Rishop, honey is produced and the people earn by selling the honey in the markets.

LAVA RESEARCH STATION:

A. Lava Research Station, Silviculture (Hills) was established by the Government of West Bengal for the practice of controlling the establishment, growth, composition, health, and quality of forest plants of economic importance.

B. Various steps are taken here for the tree improvement, which include the selection, nursery work and plantations. Clonal propagation is an important part of Tree Improvement Programme in the silviculture unit.

C. The following methods are being introduced as modern nursery practice:

1. Making of compost and proper soil mixture.
2. Use of root trainer.
3. Installation of self root pruning bed.
4. Irrigation by overhead spraying system.
5. Agronet as a shade.

D. The species which are cultured in the Lava silviculture unit are: *Rhododendron grande* (Local name: *Chimal*), *Rhododendron arboreum* (Local name: *Lali Guras*), *Acer hookeri* (Local name: *Lal Kapasi*), *Elaeocarpus sikkimensis* (Local name: *Bhadrasay*), *Acer osmastonii* (Local name: *Kapasi*), *Bucklandia populnea* (Local name: *Pipli*), *Michelia excelsa* (Local name: *Rani Champ*), *Pinus patula* (Local name: *Pine*) etc.



Figure: Silviculture Unit (Hills) at Lava.

PESTICIDES AND FERTILIZERS USED IN SILVICULTURE

UNIT:

- Various pesticides and fertilizers are used in the Lava Research Centre, Silviculture (Hills). Cowdung and nutrient rich jungle soil are generally used for the cultivation. The compost is prepared from the jungle soil. Compost chambers are situated beside the horticultural unit, where separate chambers are used for the preparation .
- Several synthetic chemicals are also used for the cultivation in the silviculture unit like:
 1. Roodex (Root hormone),
 2. Ripcord (Emulsifiable concentrate containing Cypermethrin for insect control),
 3. Bavistin (systemic broad spectrum fungicide with protectant and eradicant activities),
 4. Gibberellic acid 0.001 % (Plant growth regulator),
 5. Tafgor (insecticide, Dimethoate 30 % EC),
 6. Biozyme (liquid biofertilizer which can stimulate soil microbes and can increase the availability of soil nutrients and they also play a significant role in defending against soil-based diseases),
 7. Tracel (scientifically formulated blends of micronutrients in soluble, crystalline form) etc.



Figure: Pesticides and fertilizers used in the Silviculture unit at Lava.



Figure: Compost chamber in Silviculture unit at Lava.

TRANSPORT AND CONNECTIVITY:

- Lava is well connected with other adjoining areas of North Bengal. In public transports, there are two small buses in the morning which connect Lava with Siliguri. Additionally, there is one car which goes to Siliguri from Lava in the morning, carrying around 14-15 passengers on sharing basis. There are also sufficient numbers of private cars which can be hired for going different parts of North Bengal.
- There is no bus service in Rishop. However, the transport syndicate in Rishop provides cars which can be hired for going Lava and other places of North Bengal.
- Lava and Rishop are connected with places of Bengal and Sikkim like Siliguri, New Jalpaiguri, Gorumara forest, Lataguri forest, Murti (dooars area), Hollong, Bagdogra, Darjeeling, Malbazar, Odlabari, Tinchuley, Gangtok, Pelling, Mirik, Ravangla, Gorubathan, Kalimpong, Jorethang, Pedong, Rangpoo, Kersiong etc. Cars are the most popular mode of transport, specially in case of sightseeing purpose.

BIODIVERSITY OF NEORA VALLEY:

- **Neora Valley National Park (Figure 8) is a unique and ecologically important forest area as it includes a relatively inaccessible patch of late successional forest with rich diversity and a wide range of environmental gradients.**
- **The forest types are mainly tropical, sub-tropical, temperate and sub-temperate. Neora Valley, along with its adjoining forests of Kalimpong Forest Division, is also an important ecological corridor in Eastern Himalayas for movement of long-ranging animals to and from other contiguous protected areas in North Bengal**
- **Four habitat types are recognized in NVNP, namely: i) Subtropical Mixed Broadleaf Forest; ii) Lower Temperate Evergreen Forest; iii) Upper Temperate Mixed Broadleaf Forest; and iv) Rhododendron Forest.**
- **The forest contains approximately 680 species of angiosperms, 23 species of pteridophytes, 276 species of insects, 38 species of other invertebrates, 308 species of birds and 33 species of mammals. Approximately 20 % of the total species found in Neora Valley are extremely rare and many of those face the threats of extinction.**
- **The national park provides an opportunity for research in the various fields like behavioural ecology, habitat ecology, reproductive biology, genetics, immunology and medical research.**



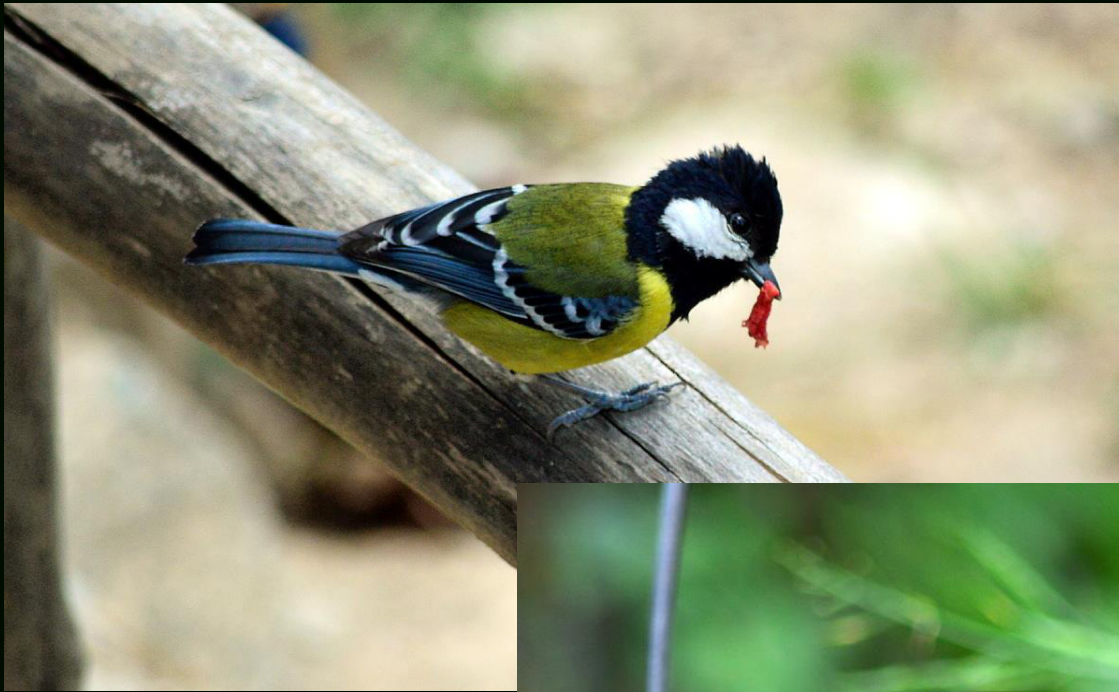
Figure: Trekking route in the forest

Common Names	Scientific Names	Uses
Chinese Pepper	<i>Litsea citrata</i>	Antidepressant, antiseptic, insecticide; helpful in heart diseases, bronchitis and asthma.
Manjistha	<i>Rubia cordifolia</i>	Detoxify blood, dissolve obstructions in blood flow.
Herbaceous Woodlander	<i>Smilacina oleracea</i>	Root extract can cure fractures.
Chirayata	<i>Swertia chirata</i>	Drug for intermittent fevers, skin diseases, bronchial asthma.
Indian snakeroot/Sarpagandha	<i>Rouwolfia serpentine</i>	Drug for high blood pressure and schizophrenia.
Ground pines/creeping cedar	<i>Lycopodium sp.</i>	For treatment of disorders of the locomotor system, skin, liver and bile, kidneys and urinary tract infections.
Himalayan ginseng	<i>Panax pseudoginseng</i>	Antibacterial, anti-inflammatory, antiseptic, hypoglycemic.
Lekh Mayal (local name)	<i>Sorbus cuspidata</i>	Can stimulate respiration and improve digestion. Also claimed to be effective in cancer treatment.
Shilapushpa	<i>Didymocarpus pedicellata</i>	Prevents the formation of urinary stones, antimicrobial property.

List of important Medicinal Plants found in the Neora Valley National Park

Faunal Diversity of Neora Valley National Park:

- **Butterflies:** Knight (*Labadea Martha*), Redbeast (*Papilo alcmenor*), Tailed Red Forester (*Lethe sinorix*), Painted Lady (*Cynthia cardui*), Golden Sapphire (*Heliophorus brahma*), Bath White (*Pontia daplidice*), Tiger Brown (*Orinoma damaris*) etc.
- **Amphibians:** Common Tree Frog (*Polypedates teraiensis*), Himalayan Frog (*Bufo himalayanus*), Himalayan Bull Frog (*Paa leibigii*),
- **Reptiles:** Flat-backed Mountain Lizard (*Japalura planidorsata*), Asian Glass Lizard (*Ophisaurus gracilis*), Flat Tailed Gecko (*Hemidactylus garnoti*), Spectacled Cobra (*Naja naja*), King Cobra (*Ophiophagus hannah*) etc.
- Neora Valley is considered as the paradise of the bird watchers. The Red Data Book enlisted species are Greater Spotted Eagle (*Aquila clanga*), Blue Fronted Robin (*Cinclidum frontale*), Broad-billed Warbler (*Tickellia hodgsoni*), Lesser Kestrel (*Falco naumanni*) etc. Besides, Black Eagle (*Ictinaetus malayensis*), White Tailed Robin (*Myiomela leucura*), Great Tit (*Parus major*), Green-backed Tit (*Parus monticolous*), Eurasian Tree Sparrow (*Passer montanus*) etc. are found.
- **Mammals:** Red Panda (*Ailurus fulgens*), Gaur (*Bos gaurus*), Leopard (*Panthera pardus*), Tiger (*Panthera tigris*), Asiatic Black Bear (*Ursus thibetanus*), Red Fox (*Vulpes vulpes*), Barking Deer (*Muntiacus muntjak*) etc.



**Figure: Green-backed Tit
at Neora Valley National
Park.**

**Figure: Eurasian
Tree Sparrow at
Neora Valley
National Park.**



SUSTAINABLE MANAGEMENT PROPOSALS:

- 1. The ecotourism spots of Lava and Rishop are least advertised or given adequate publicity. Methodical planning of sustainable ecotourism would be effective.**
- 2. micro scale rainwater harvesting structures should be installed in the houses with proper filtering systems for reducing water crisis.**
- 3. Precaution should be taken for reducing the incidents of biopiracy, as these regions are very rich in medicinal plant resources.**
- 4. Large Cardamom production is severely affected at Rishop due to water crisis. Measures should be taken for conserving that species.**
- 5. Training centers should be established for teaching the local people about the importance of natural resources. Initiatives of the local people can protect the resources of Lava & Rishop.**
- 6. The effects of climate change are more severe in the Himalayas compared to the other regions. Extensive studies on the effects of climate change on Neora Valley National Park should be done.**
- 7. Separate waste collection and disposal system should be operated by the government for safeguarding the sensitive ecosystems of the areas. Effective management design should be done for plastic wastes generated in these areas.**



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Acknowledgement:

Authors gratefully acknowledge Dr. Aniruddha Mukhopadhyay, Head, Department of Environmental Science, University of Calcutta for their kind support and inspiration.

Authors gratefully acknowledge Anup Thapa, Sujan Pradhan and Prakash Chettri, three young boys of Lava for their support and cooperation.

Photographic Documentation:

All photographs were taken by Dr. Sayan Bhattacharya (Camera: Nikon D3200 and Nikon D5100 DSLR with Nikkor 18-105 mm. VR Lens and 55-300 mm. ED VR Lens).



Thank You