

ENVIS Assam

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Assam Science Technology and Environment Council

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Editorial...

Water is an indispensable necessity for the sustenance of all forms of life on Earth. The availability of this key natural resource in the acceptable quality, in adequate quantity, at the required place and at the time needed, is very important.

Water is one of the physical elements of the environment and is a most plentiful natural substance of earth. Yet it has become a critical issue, because although water is abundantly available, freshwater, which we use for drinking, daily needs, sanitation, irrigation and industries, has become a rare commodity, and is threatened due to misuse, over exploitation and pollution.

Surface ground water is highly susceptible to pollution and degradation. While the quality of the limited quantity of water has deteriorated, the demand has increased due to growing population and water consuming activities. The withdrawal rate is higher than recharge rate resulting in depletion of the resource availability.

When seen in terms of officially estimated total available water resources of 1953 cubic kilometer, India can be seen to be in a comfortable position with respect to total water supplies. On the other hand, with about 17% of the world's population living in the country, it is comparatively in a worse position, when the water situation is seen in terms of demand and per capita availability.

At present, the annual per capita freshwater available for an Indian is one of the lowest, only 2200 cubic metre, steadily dwindled from about 6000 cubic metre in 1947; only Pakistan has a lower annual per capita water resource than India, 1800 cubic metre, while Papua New Guinea has the highest, 1,86,200 cubic metre. By 2025, when India's population will be 1.4 billion, per capita water resources will drop to 1500 cubic metre.

Water is utilized with regard to its need in direct consumption and use in human economic activities. Water is also needed to sustain the natural ecosystems both on land and in aquatic bodies. Out of the total amount of water presently utilized in India, irrigation gets 83%, domestic water supply and sanitation takes 4.5%, and about 3.5 and 3% go to the energy development and industry respectively.

The management and conservation of water, therefore, has become an issue of utmost importance. It is important to note that water conservation is not just for times of water shortage. Sound scientific practices of water use reduce the amount of stress on this resource as well as in infrastructure by limiting withdrawals, by decreasing wastewater discharge, and by reducing wear and tear on water treatment, distribution network, and wastewater treatment plants. Using less water also makes us more flexible during times of water scarcity. Conserving water is simple and inexpensive, so let us make it a practice in our day-to-day life.

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Flood problem in Assam and Application of Space Technology (Part I)

Utpal Sarma
ARSAC (ASTEC)

Flood is the most frequent natural calamities faced by India. A relatively high flow or stage in river, marked by higher than the usual, causing inundation of low land or a body of water rising, swelling and over flowing land not usually covered by water is termed as flood. It is essentially a natural hydrologic phenomenon with a large volume of surplus water that inundates the flood plains, interfere greatly socio - economic condition.

Studies shows that flood levels to the extent of 2 meters could be brought down and severity of floods could be substantially reduced in the rivers along with generation of hydro power of the order of 30,000 MW in N.E Region (M.U. Ghani).

The mean annual rainfall in the Brahmaputra basin is around 2300 mm. Internationally the Brahmaputra rank 10th in the world in terms of discharge. The water resources of NE Region has been assessed to be about 31 % of the country. However harnessing of water for irrigation and other beneficial purposes in Brahmaputra is 3%. Monsoon rainfall accounts for 75% to 80% of the annual rainfall.

The flood problem has needlessly been continuing since time immemorial. This could have been overcome by the best utilization of huge water resources of the region for poverty alleviation and sustainable development which appear as disastrous flood in some part or other part of the region every year resulting in colossal damage.

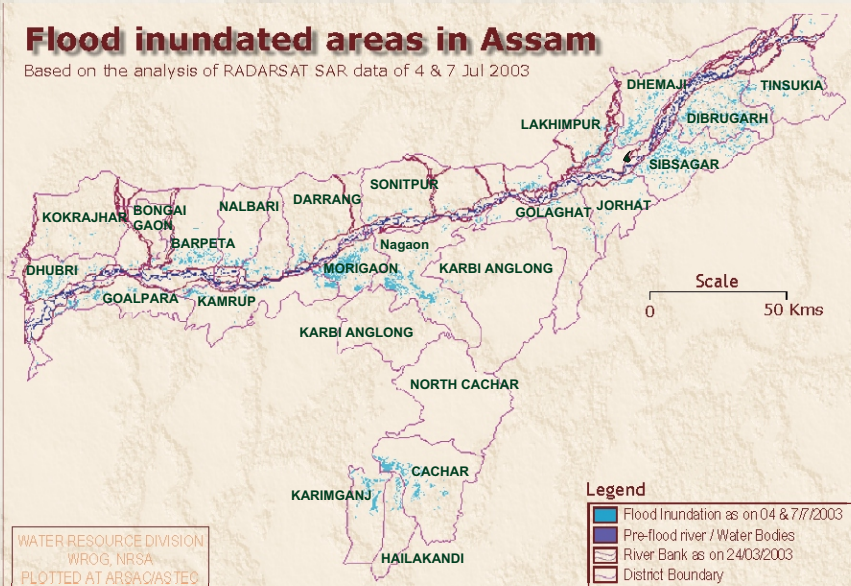
Another important river system of Assam is the Barak, the head stream of the Meghna, rises in the hills of Manipur in India and flows south-west for 250 Km. At Lakhimpur, it emerges from hills and at Bhanga, it splits into the Surma and Kushiara which cross into Bangladesh near Karimganj.

Northern tributaries of the Brahmaputra and Barak are braided and unstable in their reach. The instability of the river is mainly attributed to high sediment charge, steep slopes and transverse gradient. Apart from these the entire area is in highly seismic zone and receives Earthquake shocks of severe intensity periodically. This is also one of the factors for unstable character of the river. The Earthquake that occurred in those periods considerably disturbed the drainage network of Assam in 1897 and 1950.

The Brahmaputra and Barak river system is subjected to frequent heavy floods, drainage congestion and bank erosion resulting in extensive submergence of land, loss

Flood inundated areas in Assam

Based on the analysis of RADARSAT SAR data of 4 & 7 Jul 2003



of life and property as well as disruption in communication system. At times the period of floods above danger level is 40 to 70 days. The impact of floods was not felt to the same extent in the past as is felt now. This is due to rapid increase of population and subsequent increase in the all-round activities of man. The flood plain is gradually occupied to meet ever increasing requirements of food and fiber and consequently the flood problem has been accentuated.

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VARIATION IN SEASONWISE RAINFALL DISTRIBUTION IN ASSAM

(1995-1996 to 1999-2000)

Dr. B.K. Bhattacharyya
Formerly Professor of Agril. Statistics
Assam Agriculture University, Jorhat

Assam is basically an agricultural state and her agriculture is mainly a rainfed one. As such rainfall plays the most important role in agricultural scenario of the state. Based on rainfall distribution pattern the year has been divided into four seasons. These are:

1. Winter season : December to February
2. Summer Season : March to May
3. Monsoon Season : June to September
4. Post Monsoon season : October to November.

Rainfall distribution varies seasonally. Over a number of years, rainfall distribution varies even in the same season of different years. Similarly, flood is a regular phenomenon. Occasional drought also occurs in the state.

Seasonwise Rainfall in Assam (in mm)
(1995 -96 to 1999- 2000)

Year	W	S	M	PM
1995 - 96	70.7	778.8	1456.4	340.2
1996 - 97	67.4	495.9	1550.8	40.0
1997 - 98	91.2	617.3	1843.0	187.4
1998 - 99	3.9	685.1	1754.9	215.9
1999 - 2000	44.4	673.6	1450.6	106.7

W: Winter, S: Summer, M: Monsoon; PM: Post Monsoon
Source : Directorate of Agriculture, Assam

To see how the rainfall distributions varied over seasons and years in recent past in the state, relevant data were collected for the period 1995-1996 to 1999-2000.

In the winter season during the period of five years under consideration, average rainfall in the state varied from as low as 3.9 mm in 1998-1999 to as high as 70.7 mm in the year 1995-96. Similarly, in the summer season average rainfall in the state over the period varied from a minimum of 495.9 mm in 1996-1997 to a maximum of 778.8 mm in 1995-1996. In the monsoon season highest average rainfall in the state was 1843 mm in 1997-1998 and the lowest average rainfall was 1450.6 mm in the year 1999 - 2000. In the post monsoon season the minimum and maximum average rainfall were 40.0 mm in 1996-97 and 340.2 mm in 1995-96 respectively. Seasonwise minimum and maximum rainfall during the five years are being shown in table.

A comparison of the districts shows that there was much variation in rainfall even in the same season of different years. For example, in winter season in the year

1996-97, Cachar district received only 1.9 mm rainfall, the lowest in the year, but the same district received 435.3 mm rainfall, the maximum the next year 1997-98. Again in the year 1998-99 as many as thirteen districts out of the total twenty three districts, received no rainfall at all (0 mm) in the season and ironically Cachar district was in the group of thirteen. Thus, rainfall distribution in the winter season is found to be very erratic.

In the summer season N.C. Hills district received as much as 2636.6 mm rainfall in 1997-1998, the all time high during the five years, but in the year 1999 -2000 rainfall in the district in the same season was only 79.4 mm, the lowest of the year. Dibrugarh district received the minimum rainfall (22.8-mm) in the season during the five years.

In the monsoon season the highest rainfall during the five years under consideration was 5729.2 mm in N.C. Hills district in the year 1998-99. The lowest rainfall (76-mm) in the same season during the five years was received in Dibrugarh district in the year 1996-97.

Highest rainfall (2307.6 mm) in the Post - monsoon season occurred in the year 1995-96 in Karbi Anglong district. The lowest rainfall in the season was 1.2 mm which occurred in Hailakandi district in the year 1996-97.

Minimum and maximum rainfall (mm) in different season during 1995-96 to 1999-2000

	Minimum	Maximum
Winter	3.9	70.7
Summer	495.9	778.8
Monsoon	1843.0	1450.6
Post Monsoon	40.0	340.2

The rainfall varied markedly in the same season of different years and in the same district even Coefficient of variation values for the four seasons were found as 53%, 14%, 9% and 57% for winter, summer, monsoon and post monsoon season respectively. The values indicate that variations in rainfall in summer and monsoon season are not that high but in winter and post monsoon season the variations are quite high (i.e. much erratic).

The erratic distributions of rainfall in different seasons of the year pose a tough problem for the planners to tackle with particularly in the agricultural front.

Vigyan Chetna Jatha

Government of India is going to organise a "Vigyan Chetna Jatha (Yatra) for Himalayan Region" (VCJHR) covering 11 Himalayan States of the Country in the year 2004 in connection with the "Year of Scientific Awareness". The Department of Science & Technology, Government of India has entrusted Assam Science Technology & Environment Council, Guwahati, Assam to organise some Jatha activities throughout the state this year (2003) on a pilot basis. The pilot project has to be completed within December 2003. *The main focus of the Jatha will be on Environment & Health.* Different phases of this Jatha would include preparation of software, pre-Jatha activities, actual Jatha and some post-Jatha activities. Organisation of a programme of this nature would include lot of voluntary efforts as was done in 1987 & 1992 in background material preparations, software production, involvement of individuals, non-government and governmental agencies, etc.

VATAVARAN 2003

VATAVARAN - India's Exclusive National Environment and Wildlife Film Festival is organised by Centre for Media Studies and supported by Ministry of Environment & Forests, Government of India. The theme for the Film Festival VATAVARAN 2003 will be "Water for life". The aim of the Festival is to encourage concern and recognise excellence in environment and wildlife productions and to raise public's interest in specific issues concerning future of the Mother Earth. The films/videos containing on Indian environment and wildlife conservation issues are invited for participation in VATAVARAN 2003. VATAVARAN 2003 will be held during 18-20th November 2003 at India Habitat Centre, New Delhi. The festival also provides educational resources and showcases numerous events in the shape of seminars, workshops and many hands on activities.

For more information contact: Centre for Media Studies, Research House, Community Centre Saket, New Delhi 110 017, Ph. 91-11-2686 4020, 26851660, Fax: 91-11-26968282, e-mail: vatavaran2003@cmsindia.org, website: www.cmsindia.org/vatavaran2003

New Disaster Mitigation Newsletter

Disaster Mitigation in Asia, a moderated electronic newsletter is provided by the Asian Disaster Preparedness Centre to share updates on disaster mitigation in Asia, including the latest information sources and analytical amounts of new approaches, methodologies, models, resources, and tools for disaster risk reduction. The e-newsletter is sent to almost 2000 subscribers and invites questions from the readership, responses, and contributors. For more information contact: audmp@adpc.net, website: www.adpc.ait.ac.th/audmp/e-news/

Simple Method of Fluoride Estimation in Ground Water

Bhabha Atomic Research Centre (BARC) has developed a method for the estimation of fluoride in ground water based on the bleaching of Zirconium- Xylenol Orange complex. In this method, the metal to ligand ratio has been optimised. Acidity and dye concentration have been optimised such that distinct colours are produced at three different levels (deficient, normal and toxic) of fluoride. Zirconium ions get polymerised at a lower acidity, affect colour development. De-polymerisation of Zirconium ions has been found by using specific treatment, which help in instantaneous colour development. Stability of the reagent solution has been tested. Purity of the dye is important in getting colour contrast and stability. This method can be used for field testing by a common man too.

Source: *Nuclear India*, 36 (11-12), 2003.

Assam province is also experiencing the contamination of water by fluoride in the district of Karbi Anglong and Nagaon. People in these areas are facing severe anemia, stiff joints, painful and restricted movement, mottled teeth, muscle degeneration, kidney failure, and premature death. Many in the area have become crippled for life.

2003-2004 Stockholm Challenge Award

The Stockholm Challenge is an international awards programme for pioneering projects using IT in innovative ways, in areas such as environment, education, health, culture, e-government and e-business. The aim is to diminish the digital divide and to create an information society for all. The competition is open to private, public and academic contestants. Projects compete in six categories, in areas where IT has great influence on people's lives, culture, education, environment, health, e-government and e-business.

Stockholm Challenge rewards projects that are of great importance to local progress, and of such innovative and pioneering structure that it should serve as a model for regions, cities and countries.

Project entries must be submitted online at http://www.challenge.stockholm.se/entryform_index.html, and the deadline for submitting an entry is November 1, 2003.

For more information, contact:

Email: pernilla.nylander@challenge.stockholm.se

Web: <http://www.challenge.stockholm.se>

Course on Environment Education

Nowgong Girls' College, Nagaon is organising a Certificate Course on Environment Education in association with the Assam Science Technology and Environment Council. For further details contact Principal, Nowgong Girls' College, Nagaon 7812001. Ph: 03672 220667. Last Date 25th Aug. 2003.

International Conference on Water and Environment, WE-2003

The conference is an invitation to all scientists, researchers, engineers, decision-makers and administrators who are dealing with water and environment to discuss perspectives, problems and solutions.

Organised by: Regional Research Laboratory, MP.

15-18th December 2003, Bhopal, Madhya Pradesh, India

website: <http://www.rrlbpl-we2003.com/committee.htm>

e-mail: dryadava@yahoo.com

19th World Mining Congress & Expo

The basic theme of the Congress: Mining in the 21st century - Quo Vadis. The Congress will offer engineers from all over the world a communicative contact platform to wrestle with the major problems that confront the Mining Industry world wide. The Expo-2003 will showcase the latest in technology.

Organiser

The Institution of Engineers (India), Indian National Committee of World Mining Congress

Nov. 1-5 2003, New Delhi, India

For more information contact: The Organising Secretary, 19th World Mining Congress, The Institution of Engineers (India), 8 Gokhale Road, Calcutta 700 020, India, Tel +91 33-223-8311 Fax: +91 33-223-5068 Email: international@ieindia.org

Asian Conference on "Environmental Education and Civil Society"

The conference aims to envisage the cause of Environmental Education and to continue with its tradition of interchanging ideas for recognizing and responding to major environmental challenges. This conference will facilitate to keep the agents and target groups abreast of current developments in environment education.

November 7-9, 2003, New Delhi, India

For more information, please contact:

Dr. Desh Bandhu, President, Indian Environmental Society (IES)
U-112, Vidhata House, Vikas Marg, Shakarpur, Delhi 110092
Phone: (011) 22046823/22046824/22450749 Fax:(011) 22523311; Email: iesenro@del2.vsnl.net.in

International Conference on Water Resources Development

(IndiaCore Promoted Event)

The Conference theme is to increase awareness of the role which Hydropower can play in sustainable development as the most important source of Renewable Energy.....

February 4- 6, 2004 at New Delhi, India, Organiser: The Dams Society, The Hydropower Association, Council of Power Utilities

Event Details

For further details and Registration, contact info@indiacore.com

www.nic.in/mowr/

The site can help the users to access policy guidelines and programmes laid down by the Ministry of Water Resources for the development and regulation of country's water resources.

<http://egj.lib.uidaho.edu/>

User can access the disseminating information concerning sources on international environmental topics including assessment, conservation, development, disposal, education, hazards, pollution, resources, technology, and treatment.

www.airimpacts.org

Through this site user can access global awareness of environment, health, and economic impacts of air pollution, including climate change.

www.indianenvironmentonline.net

The site contains links to news, articles, press releases and resources related to the environment in India.

Water and Climate Bibliography

The Pacific Institute has created the Water and Climate Bibliography containing: a searchable online database containing over 3,000 references to books, articles, and other scholarly works. It is also available on CD-ROM. Access main Bibliography page at www.pacinst.org/resources/.

Sustainable Land Application Conference

The conference aims to review contaminant reactions in soils and fundamental and specific reactions of constituents in non-hazardous wastes and synthesize multi-disciplinary information and characterize the "state-of-the science", Identify high priority and critical research needs and Promote interdisciplinary approaches to solving societal problems of waste disposal. Sponsor: United States Environmental Protection Agency, Water Environment Research Foundation, National Centre for Sustainable Water Supply. Wyndham Palace Resort and Spa, Lake Buena Vista, Florida, USA. January 4-8, 2004

For more information contact
George A. O'Connor, *Program Chair*
University of Florida/IFAS, Soil & Water Science Department, PO Box 110510, Gainesville, FL 32611-0510 Phone: 352-392-1804 ext 329 Fax: 352-392-3399, Email: gao@ufl.edu

Flood problem in Assam and Application of Space Technology (Part I)

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Floods in the region occur due to variety of causes as mentioned below:

- River channel carrying flows in excess of the transporting capacity within their banks. This is due to excessive precipitation that occurs in NE-India.
- Backwater in tributaries at their outfalls into the main river because of non-synchronization of peak floods in them.
- Heavy rainfall in short space of time.
- Storms
- Inadequate drainage to carry away surface water quickly.
- Aggravation of river bed.
- Inadequate waterways at rail and road crossing and encroachment in the flood plains.
- Degradation of catchment area in forms of deforestation, jhuming and loss of soil mantle in Himalayan friable watershed.
- Lack of proper control of landuse

Satellite Remote Sensing is found to be an effective tool to supplement information regarding flood in near real time basis. Near Real time information is the key for the user departments in organizing the relief operations. For this flood inundation information has to be furnished to them as early as possible and Space Borne Technology is found to be authentic and cost effective tool for dissemination of the same. Further to use satellite remote sensing more effectively water level data of the rivers is necessary (source: CWC, Govt. of India). Since rising trend above danger level is indication of probable occurrence of flood, the water level information will facilitate to select proper satellite data during flood peak time. One limitation with operational Indian satellite is non-availability of microwave sensor which has cloud penetration capability, hence one has to depend on satellite having microwave sensor viz. RADARSAT SAR data.

Query Form

1. Name :
2. Organisation/Designation/Mailing Address :
3. Your comments on the newsletter
4. Suggestions for improvement :
5. E-mail ID

I would like to search information on following :

Subject Keywords

1. Biodiversity
2. Natural Resource
3. Pollution
4. Solid waste
5. Natural hazards
6. Energy
7. Sustainable development
8. Deforestation
9. Weather and climate
10. Waste water treatment
11. Urbanisation
12. Landslide
13. Environment education
14. NGOs and environment
15. Others

Signature

Key Facts about Water

- There are more than 1.4 billion cubic kilometres (km³) of water in earth.
- This amount of water is enough to give every man, woman and child more than 230 million cubic metre if we were to divide it evenly.
- More than 98% of the world's water is salt water.
- Most freshwater is locked in the polar ice caps.
- Less than 1%, i.e. about 280,000 cubic kilometres, of the earth's freshwater is accessible in lakes, rivers and groundwater aquifers.
- Agriculture accounts for over 80 per cent of world water consumption.
- Sixty per cent of water used for irrigation is wasted.
- A 10 per cent improvement in irrigation efficiency could double the drinking water supply for the poor.

Some of the Threatened Pteridophytes and Angiosperms of Barak Valley

Plant species	Status	Causes of threat
<i>Aloe barbadensis</i>	CR	Medicinal property
<i>Andrographis paniculata</i>	VL	Medicinal property
<i>Aquilaria malaccensis</i>	CR	Medicinal property & economic uses
<i>Arundina graminifolia</i>	VL	Medicinal property
<i>Asplenium nidus</i>	VL	Medicinal property
<i>Bacopa monnieri</i>	VL	Medicinal property & vegetable
<i>Baccaurea ramiflora</i>	R	Medicinal property & fruit edible
<i>Bambusa mastersii</i>	R	Economic uses
<i>Cissus quadrangularis</i>	R	Medicinal uses
<i>Clausena heptaphylla</i>	R & E	Economic uses & medicinal property
<i>Coptis teeta</i>	CR	Medicinal property
<i>Costus speciosus</i>	E.	Medicinal property
<i>Cyathea gigantea</i>	R	Habitat destruction
<i>Dendrocalamus cachari</i>	R	Economic uses
<i>D. indicus</i>	R	Economic uses
<i>D. strictus</i>	R	Economic uses
<i>Dipteris wallichii</i>	R	Habitat destruction
<i>Dioscorea bulbifera</i>	EN	Medicinal uses
<i>Drosera peltata</i>	R	Population thin
<i>Dendrobium sulcata</i>	R	Economic uses
<i>Elaeocarpus sphaericus</i>	EN	Economic uses
<i>Helminthostachys zeylanica</i>	R	Population thin
<i>Holarrhena pubescens</i>	VL	Forest destruction
<i>Homalomena aromatica</i>	R	Economic uses
<i>Huperzia squarrosa</i>	R	Habitat destruction
<i>Hyptis suaveolens</i>	EN	Economic uses
<i>Paphiopedilum fairleanum</i>	R	Population thin
<i>Phallostachys assamica</i>	R	Population thin
<i>Phlegmarius phlegmaria</i>	R	Population thin
<i>Pteris grevilleana</i>	R	Population thin
<i>Rauvolfia serpentina</i>	EN	Medicinal property
<i>Sommanianthus dichotoma</i>	R	Industrial uses
<i>Zingiber zerumbet</i>	CR	Industrial uses

R. : Rare; V.L. : Vulnerable; C.R.: Critically rare;

E. : Endemic; E.N. : Endangered

Source : *Ecobios*, 1 (1), 2002

AN OVERVIEW ON WETLANDS IN ASSAM

Dr. Pradip Sharma
Cotton College

Wetlands have been defined in many ways in different countries. But the definition given by the International Union for Conservation of Nature and Natural Resources (IUCN) has been widely accepted which is also suitable to define the wetlands in India. In this definition all submerged or water saturated lands, natural or man-made, inland or coastal, permanent or temporary, static or dynamic, vegetated or non-vegetated, which necessarily have a land water interface are called wetlands. Besides providing water for drinking as well as raising crops, the wetlands have been helping the mankind in various ways like controlling flood, ground water recharge, improvement of water quality, storm protection and stabilization and conservation of biodiversity. Moreover wetlands provide various economic resources. It helps in generating employment through pisciculture, tourism etc.

Assam is endowed with a large number of wetlands. The floodplains of the Brahmaputra and Barak rivers dotted with these wetlands. The lake water bodies are locally known as *beel*, while the marshes and swamps are variously called as *jalah*, *doloni*, *pitoni*, *hola*, *doba* etc. All these features are included under the comprehensive term wetlands. Normally beels represent vast sheets of water with varying shape, size and depth. Some of them are partly or fully infested with floating mat of aquatic plants. Reeds, grasses and bushes comprise the common natural vegetation in the shore areas of the beels. The swampy or marshy areas such as *jalah*, *pitoni*, *doloni*, are generally shallower than beels. They are normally developed close to river banks and on ageing shallow beel. Some of them are very extensive although most are smaller in size.

Generally the wetlands are the home of a large variety of fauna and flora, some of which are of extremely rare and endangered type while others are of great ecological or economic value.

The wetlands in Assam can be divided into two broad genetic categories- natural and man-made. Lakes, ponds, cut-off and ox-bow meanders, seasonally waterlogged areas, swamps and marshes are put in the natural category while reservoirs and tanks are called man made wetlands. The distribution of these, wetlands in the state has been presented in the Table-I.

The total number of wetlands with size larger than 2.25 hectares in the state is 3513 which cover an area of 1012.31 sq. km. Among 23 districts in Assam Nagaon district accounts highest 379 numbers. On the other hand the North Cachar Hills district accounts the least 10 numbers only. Area wise Marigaon district records maximum under wetlands with 11,658 hectares while Hailakandi district records the minimum 840 hectares. As many as 712 numbers of swampy/marshy areas have been identified in the state which cover an area of 43,433.5 hectares i.e. about 42.9 percent of the total area under wetlands. The Son beel of Karimganj district has been identified as the largest wetland in Assam which covers an area of 3010 hectares. The frequency distribution of wetlands under different size categories at 100 ha interval is shown in the table-2. Majority of the wetlands have sizes less than 100 hectares. In this category 3341 numbers of wetlands have been recorded.

Table - 1

Distribution of different types of wetlands in Assam

Wetland type	No.	Area (ha)	Percent
NATURAL			
*Lake/pond	690.00	15494.00	15.31
*Ox-bow Lake/ Cut-off Meander	861.00	15460.60	15.27
*Waterlogged (Seasonal)	1125.00	23431.50	23.15
*Swamp/Marsh	712.00	43433.50	42.91
Total	3388.00	97819.60	96.63
MAN-MADE			
*Reservoirs	10.00	2662.50	2.63
*Tanks	115.00	749.50	0.74
Total	125.00	3412.00	3.37
G. Total	3513.00	101231.60	100.00

Source : ARSAC Reports on Wetlands of Assam

Table - 2

Size wise distribution of wetlands in Assam

Area Class (Ha)	Total Number	Total Waterspread Area (Ha)	Total Vegetated Area (Ha)	Total Wetland Area (Ha)
1.0-100.0	3341	52878.1	1920.5	55821.5
100.1-200.0	100	12921.5	947.5	13869.0
200.1-300.0	36	7979.5	537.0	8527.0
300.1-400.0	14	4505.0	328.0	4823.0
400.1-500.0	4	1815.0	0	1815.0
500.1-600.0	9	2625.0	602.5	3227.5
> 600.1	12	13068.0	70.0	13148.0
TOTAL	3516	95792.1	4405.5	101231.0

Source : ARSAC Reports on Wetlands of Assam

Endemic Orchids of Assam

Cypripedioideae Lindl.

Paphiopedilum spicerianum (Reichb.f.) Pfitz.

Epidendroideae Lindl.

Bulbophyllum obrienianum Rolf.

B. ornatissimum (Reichb.f.) J.J. Sm.

Calanthe odora Griff.

C. vaginata Lindl.

Dendrobium miserum Reichb.f.

D. parviflorum Reichb.f.

D. perula Reichb.f.

D. spatella Reichb.f.

Eria pumila Lindl.

Galeola altissima (Bl.) Reichb.f.

Liparis mannii Reichb.f.

L. plantaginea Lindl.

L. vestita Reichb.f.

Nephelaphyllum cordifolium Lindl.

Pholidota calceata Reichb.f.

Tainia barbata Hk.f.

T. hastata Hk.f.

Spiranthoideae Dressler

Habenaria trifurcata Hk.f.

Vandoideae Endlicher

Eulophia candida Hk.f.

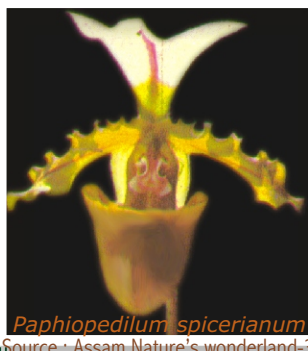
Luisia macrotis Reichb.f.

L. micrantha Hk.f.

Phalaenopsis mastersii K. & P.

Pomatocalpa mannii (Reichb.f.) J.J. Sm.

Source : State Biodiversity Strategy & Action Plan, Assam 2002



Paphiopedilum spicerianum
Source : Assam Nature's wonderland-3

Index number of Agricultural Production in Assam

Base Triennium ending 1981-82 = 100

		Production	Productivity
Food grains	1997 - 98	149.06	126.35
	1998 - 99	143.11	125.37
	1999 - 2000	168.47	137.17
	2000 -2001 (P)	173.63	151.44
Non-food grains	1997 - 98	161.91	103.20
	1998 - 99	169.94	104.69
	1999 - 2000	162.91	118.77
	2000 -2001 (P)	162.34	135.49
All commodities	1997 - 98	155.72	111.09
	1998 - 99	157.02	111.64
	1999 - 2000	165.58	127.36
	2000 -2001 (P)	168.31	144.97

P: Provisional

Source : Statistical Handbook, Assam, 2002

Garcinia pedunculata Roxb.

Family: Clusiaceae

Assam- *Bor-theke*;

Beng- *Tikul, Tikur*.

The tree is found sporadically in upper Assam up to an altitude of 3,000 ft. and in Manipur; it is sometimes cultivated. Height is 50-60 ft. The tree flowers from January to March



Source: Signatures of Plants through Camera

and fruits ripen from March to June. It is one of the largest fruited species of the genus and is worth trying as a stock for mango-steen. The fruit is acid and is eaten raw or cooked. The yellow pericarp is of acid taste and can be used in place of lime or lemon. The fruit is used as a fixative or as a mordant for saffron dye. Malic acid (13-20%) is the principal acid of the fruit pulp. The timber is said to be useful, after seasoning, for planks, beams and building purposes. The fruit can be used for remedy of dysentery and cough and in constipation and other stomach disorders. The fruits are constituent of Ayurvedic formulation known as Dadhika Ghrita.

Source : The Wealth of India: Vol. IV Pg. 107 & Ethno Medico Botany of Arunachal Pradesh Pg. 84

Solar Electrification in Villages of Assam

Year	No. of Villages	No. of Families	Total Power Generated (Watt)	Conventional Power Savings (Watt) *
1991 - 92	1	6	222	480
1992 - 93	2	28	1036	2240
1993 - 94	3	97	3589	7760
1994 - 95	3	94	3478	7520
1995 - 96	9	367	13579	29360
1996 - 97	3	77	2849	6160
1997 - 98	5	235	8695	18800
1998 - 99	1	450	16650	36000
1999 - 2000	11	357	13209	28560
2000 - 2001	36	950	35150	76000
2001 - 2002	Distributed	400	14800	32000
2002 - 2003	35	2000	74000	160000
2003 - 2004(P)	250	10000	370000	800000
2004 - 2005 (P)	500	20000	740000	1600000
2005 - 2006 (P)	850	34000	1258000	2720000
2006 - 2007(P)	1050	42000	1554000	3360000
2007 - 2008 (P)	1200	48000	1776000	3840000

Total No. of Remote unelectrified Villages in Assam = 2800, P: Provisional

* Assuming 1 Home Lighting system replaces 80 W of Grid Power Supply

Courtesy : Assam Energy Development Agency/Assam Science Technology & Environment Council, Assam

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You are welcome to contribute articles, photographs with details, news or in any other form pertaining to the State Environment Related Issues, Assam for publishing in our subsequent newsletters.

Please send your views and opinions.

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