Flood in Assam: Prospect of mitigation
Dr. Indrajit Dutta

The Scenario:
Recurring floods in Brahmaputra and Barak Valleys of Assam affect large areas almost every year. Starting generally from May to September, this natural calamity hits 3 to 5 lakh hectares of crop land depending on its magnitude. 47 lakh people of 5,300 villages were badly affected during the floods of 1998. Agricultural crops in 9.7 lakh ha were damaged, 30,400 dwelling houses were swept away, 156 people and 7814 Nos. of cattle died. During 2004-05 floods 9,97,262 ha of crop area and 14, 30, 830 Nos. of small and marginal farm families were affected.

The flash flood and early floods are most common in the districts of Dhemaji, Lakhimpur, Sonitpur, Darrang and Jorhat although as many as 17 districts out of 23 generally face floods fury. Annual loss ranges from Rs. 50 to Rs. 100 crore and in severe case it shoots up to Rs 1000 crore.

In recent times many of the districts are facing acute problem of sand deposition converting fertile cultivated lands into barren lands overnight. Heavy river bank erosion is also causing serious problem to many riverine areas. The state has 31,50,000 ha of flood-prone area out of which 17,27,000 ha have been covered under various protective measures.

The flood situation in Assam disturbs the socio-economic system of all the N.E. sister states as surface communication, both road and rail, to all other states of the region passes through Assam only.

Statement of flood damages of the last five years

<table>
<thead>
<tr>
<th>Year</th>
<th>Crop area affected (Ha)</th>
<th>Farm Family affected (Nos.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2001</td>
<td>2,92,903</td>
<td>6,36,102</td>
</tr>
<tr>
<td>2001-2002</td>
<td>28,015</td>
<td>65,675</td>
</tr>
<tr>
<td>2002-2003</td>
<td>5,71,577</td>
<td>7,83,832</td>
</tr>
<tr>
<td>2003-2004</td>
<td>3,81,796</td>
<td>6,16,793</td>
</tr>
<tr>
<td>2004-2005</td>
<td>9,97,262</td>
<td>14,30,830</td>
</tr>
</tbody>
</table>

Factors: Natural and man made:
Flood is a natural phenomena. Higher the quantum and intensity of precipitation, higher is the rate, extent and duration of occurrence. However, man's interference with the natural drainage system and excessive exploitation of the watershed areas aggravate the situation.

The route water takes when it flows over the ground is called a drainage line. The area from which water drains to this route i.e., the drainage line, is called a watershed. Those are naturally existing units which do not follow political boundaries. When the drainage line originates to drain out the run-off, it is called first order stream. First order streams join together to form second order streams and subsequently streams go on joining and become larger streams which are called rivers.
Thus in Assam, rather in the entire region, an excellent net-work of drainage channels have existed in the form of numerous streams, rivulets, rivers, etc. which drained away the excess run-off water in most effective way. Due to large scale disturbance in the watersheds as well as in the drainage channels, the system has lost its effectiveness. Because of this the flood problem in Assam has reached the present gigantic dimension. Major factors responsible for floods are briefly discussed below:

1. **Heavy precipitation**: The region receives exceptionally high rainfall, the annual average being about 400 cm. Further, sometimes the intensity of rainfall is so high that more than 40 cm. of rainfall is received in a single day which is higher than the average annual rainfall of many countries of the world. When such high quantum of rainwater has to rush through a narrow valley, flash flood is the natural outcome.

2. **Susceptible water sheds**: Assam is surrounded by Bhutan Kingdom on its North-Eastern side and the North-Eastern states- Arunachal Pradesh, Nagaland, Manipur, Mizoram and Meghalaya on its North, East and Southern sides. All these hilly terrain mostly drain into the saucer shaped Brahmaputra and Barak Valley. These hilly lands are very thinly populated, more than two-thirds areas are covered with forest. The forests were community-controlled property and the livelihood of people were perfectly blended with nature. There was minimum disturbance to the local natural resources. The communities have lived in those surroundings and evolved their patterns of living influenced by those forms of nature.

In the name of modernization and development hill-slopes were opened and denuded. Man’s thirst for quick money has depleted the natural covers leading to heavy soil erosion. The fragile geo-morphological terrain comprising easily weathered sedimentary rocks, steep slopes and narrow valleys naturally could not withstand such onslaughts. Moisture retention capacity of the catchments (watershed) has been drastically reduced. As a result, the excess run-off began to erode away the soil, silt, sand, pebbles, gravels, even boulders from the exposed slopes and carry them down streams in enormous quantity. The drainage channels started clogging and the river beds began to rise with these deposits. The carrying capacity of the rivers got drastically reduced, triggering a chain of events leading to flash-flood, river-bank erosion, change of river course, sand deposition in agricultural lands etc. etc.

The removal of top-soils which are the storehouse of organic matter and plant nutrients at the rate of 1130 M.T./ sq k.m. per annum is quite alarming.

3. **Deforestation**: Deforestation is one of the major contributing factors of flood both in the upper and lower catchments. While illegal tree felling and clearing for settled agriculture and development activities such as road-construction, new settlement for civil and commercial activities lead to large scale deforestation in hill areas, large-scale forest encroachment and rampant illegal felling are two main causes of deforestation in the plain areas. Instead of 30% prescribed norm, Assam does not have more than 20.6% forest cover, that too, including the two hill districts of the state. In addition to the dense forest areas, Assam has 14,784 sq. k.m. of open forest whose canopy density is less than 40% and therefore these are not effective for Soil and Water conservation purposes.

4. **Rising of Brahmaputra river bed**: The Brahmaputra, one of the largest rivers of the world, originates from south of Tibet (China) at 5300 M height near Manas Sarovar, traverses an easterly course of 1625 k.m. in China and reverses to western course on entering India. It traverses 918 k.m. in India (Assam & Arunachal) then flows downward a distance of 337 k.m. through Bangladesh to join the Ganges and falls into Bay of Bengal. Out of 5,80,000 sq k.m. of its catchment 50.5% falls in China, 33.6% in India, 8.1% in Bangladesh and 7.8% in Bhutan. The average discharge during rainy season
recorded at Pandu is 20,000 cumec, during flood the range fluctuates from 50,000 cumec to 75,000 cumec. During the winter lean period the average discharge is less than 2000 cumec.

It is observed that the 1950 earth-quake (Richter scale 8.7) has considerably raised its bed resulting into extensive erosion on the southern bank and manifold increase of the flood plain.

5. Embankments: For protection of flood, embankments were constructed on both sides of the flood-prone rivers including the Brahmaputra since 1954 to 1970. During this period 4566 k.m. of embankments were constructed. These were partly effective in combating flood menace. But the benefit was short-lived due to improper specification, poor maintenance. The breached embankments and insufficient outlets led to serious flood problems, giving the embankments a dubious character, both beneficial and harmful.

6. Enchroachments and interference with drainage: Construction of roads, highways, railway lines, etc. without considering the nature and pattern of drainage system of the area have contributed in enhancing the flood problem in many parts of the state.

Due to population explosion, extension of crop-lands and human habitations have suffocated the natural drainage system in many areas resulting into acute flood problem.

Control Measures Adopted: Various short and long-term measures are being adopted to control and minimize the effect of flood.

1. Brahmaputra boards: The Brahmaputra Board has been set up under Parliament Act No. 46 of 1980 and covers the entire valley comprising the Brahmaputra and Barak river systems. The states of Arunachal Pradesh, Assam and Meghalaya are covered fully and Nagaland, Mizoram, Manipur, Tripura partially.

The Board has prepared Master Plans for Brahmaputra main-stem and separately for its 38 tributaries; for Barak River and its tributaries and for 8 rivers of Tripura. In all, 48 Master Plans have been prepared. The Master plans apart from the Technical data, also contain useful information on social and economic life of the communities living in respective river basins.

For drainage development as many as 33 drainage congestion areas have been identified for reducing the duration of submergence.

2. Watershed Treatments: Migration Measures
(I) Integrated Wasteland Development Project (IWDP): This is an important programme of the Department of Land Resources, Govt. of India. Due to lack of proper care most of our natural watersheds have degraded into wastelands. Complete apathy towards the natural resources has been responsible for the denudation of the watershed resources ie water, land and vegetation.

Development of wastelands as watershed units for in-sittur retention of rainwater, most effective utilization of soil moisture and proper land use for optimum and sustained productivity through various self-help user groups are the main objectives of this programme.

54 Nos. of IWDP programmes covering 20 lakh hectares of affected land are being taken up and work is in progress in 25 Nos. of projects covering 9 lakh hectares of land.
(II) National Watershed Development Project in Rainfed Areas (NWDPRA) : This is also a Govt. of India scheme. Watersheds without proper irrigation facilities and mainly dependent on rain water and producing less than optimum level of productivity are brought under NWDPRA. In-situ moisture conservation and land protection through agronomic and vegetative methods using indigenous materials available locally are attempted for increasing crop production to optimum level. Income of the farm families under the project area is supplemented with various auxiliary schemes such as pisciculture, poultry, dairy, piggery, beekeeping, sericulture and weaving etc.

In the first phase 108 Nos. of projects have been completed, covering 50,000 hectares of land and 48,000 Nos. of farm-families were benefited.

(III) Pagladiya River Valley Project : This is the first river-valley project implemented in the state of Assam mainly to mitigate flood caused by Pagladiya river in the Nalbari district. Various soil and water conservation measures, including large scale tree plantation were taken up in critical areas (micro-watersheds) which has significantly reduced the flood intensity in the project area 35,000 hectares of affected land have been treated and 32,000 nos. of families were benefited.

(IV) Flood-Prone River Valley Project : This project has been envisaged by Govt. of India to tackle simultaneously upper and lower catchments of a flood-prone river flowing through two contiguous states. The project is found to be most effective in mitigating flood. Following rivers have been selected under this project.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of River</th>
<th>Upper Catchment</th>
<th>Lower Catchment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Singla river</td>
<td>Mizoram</td>
<td>Assam</td>
</tr>
<tr>
<td>2</td>
<td>Jiadhal river</td>
<td>Arunachal Pradesh</td>
<td>Assam</td>
</tr>
<tr>
<td>3</td>
<td>Dikrong river</td>
<td>Arunachal Pradesh</td>
<td>Assam</td>
</tr>
<tr>
<td>4</td>
<td>Dhansiri river</td>
<td>Arunachal Pradesh</td>
<td>Assam</td>
</tr>
<tr>
<td>5</td>
<td>Doyang river</td>
<td>Nagaland</td>
<td>Assam</td>
</tr>
<tr>
<td>6</td>
<td>Kopili river</td>
<td>Meghalaya (Partly)</td>
<td>Assam</td>
</tr>
</tbody>
</table>

(V) Afrorestation : Forest cover is most effective tool to mitigate flood in addition to its numerous benefits. The state has taken up massive tree plantation programme. The state Forest department has covered 14,560 hectares in plain areas during 2004-05. The total are covered for tree plantation by other agencies, including hill areas is, about 18,000 hectares. Target for the current year i.e 2005-06 is estimated to be 20,000 hectares.

3. Contingent crop planning : The department of Agriculture prepares a contingent crop-planning to minimize the reduction in losses of production by way of selecting appropriate / alternate crop, suitable variety and by way of adopting appropriate production technology.

Arrangements are made for supply of paddy seedlings of suitable varieties by raising community nurseries and seed corporations departmental nurseries, supply of seeds for winter rice, early vegetable, black gram, green gram etc. Support for Rabi Cropping with toria, peas, lentil, groundnut, wheat, potato etc. depending on land situation and soil properties is given. Other necessary support such as tractorisation, desiltation, plant-protection and supply of sterilizers are also made available immediately after recession of flood.

The Assam Agriculture University organizes training on various aspects of Agriculture in flood-affected areas in its Krishi Vigyan Kendras (KVK) and Regional Research Stations (RARS).
4. **Flood plant zoning**: Flood forecasting and flood warning are now regularly made to keep the people alert and to take necessary steps as per advance action plan. Flood-plain zoning is the latest attempt to avoid onslaught of flood. For example, in zone III areas the plinth height of the dwelling houses should be 3 M and important public buildings, Govt. constructions (commercial /industrial) should be avoided.

5. **Raised platform**: Raised platforms are found to be very useful mainly to protect the cattle population during flood. Raised platforms become more effective when consolidated with tree planting, specially the fodder trees.

Brahmaputra Board has constructed 16 Nos. of raised platforms and plans to extent the same to other critical areas.

**Conclusion:**

The above measures, if co-ordinated properly and implemented effectively, will mitigate the chronic flood problem of the state to a certain tolerable level.

It is expected that people’s demand to declare the flood problem in Assam, as a National priority will be fulfilled soon. This will facilitate implementation of the Master Plans providing socio-economic security to its people.

The writer is an agriculture scientist. He has held various posts of responsibility in the area of soil conservation and has several research papers to his credit presented international seminars. He retired as Director, Soil Conservation, Assam in 2003.