

# A CRITICAL REVIEW ON PREVENTING RIVER BANK EROSION BY USING PLANT AND VEGETATION



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# Introduction

- While forest or plant can prevent soil erosion, its application differs significantly depending on purpose.
- The process of surface erosion from a catchment and process of river bank erosion differ grossly.
- Therefore selection of plant species and its implementation need to be done judiciously considering cause of failure and type of bank materials.
- Understanding differences between these processes and types of vegetation required to retard these erosion processes are extremely important
- Let us discuss some of these aspects to help adopting appropriate eco-friendly technology for bank protection.

# Vegetation and rain induced surface erosion

- The canopy covers intercept the raindrops, reduce its high kinetic energy, and thereby prevent splash erosion.
- The mulches and grasses prevent rill erosion and gully formations caused by energy of surface water.
- Forest increases initial abstractions and the grass root system promotes infiltration, thus, these combined effects reduce surface run-off and eroding power of run-off
- Further as these processes increase the time of concentration, the peak flow in the main stream also gets attenuated.
- Therefore, massive afforestation in the catchment can reduce the sediment load and peak discharge in the river.
- These, though have long term positive effects on reducing bank erosion, cannot control bank erosion directly.

# River bank erosion and vegetative practices

- River bank fails due various causes
  - Attack by direct and secondary current due to adverse orientation of flow direction
  - Wave action due to boat movement etc.
  - Sudden draw down during flood recession
  - Failure due to Seepage
- Protection measures should be design in accordance with the cause and
- Protection measures may also fail because of outflanking of bank

# River bank erosion and vegetative practices

- Depending on the orientation of flow-direction of a river, both direct current and secondary current may attack the river bank and can erode the bank materials of the vertical face
- Because of the presence of secondary current in a bend of a meandering channel or a curved side-channel of a braided river, the lower part of the bank generally gets eroded and the upper part eventually collapse due to lack of support.
- This calls for need of a cover material that can protect the bank from repetitive impact of high speed current.
- Vegetation having good spread with flexible leaves and stems can provides a cushioning effect to absorb energy of high speed current and can prevent such type of failures.

# River bank erosion and vegetative practices

- During flood recession period, due to sudden draw-down condition, a river bank having relatively less permeable soil like loamy soil or silty clay, may collapse as the saturated weight of the soil disturbs the slope stability.
- Any additional weight on the bank will add to the disturbing force and will promote slope failure.
- Thus trees having weight, that too with poor root system (like banana tree or bamboo), will act adversely in such situations.
- Light weight grasses with deep root system like vetiver or some other locally available native species (Ipomia or kolmou or Bhothra, Sthalapadma or kanchan) can help preventing erosion in such cases.

# River bank erosion and vegetative practices

- Another possibility is failure due to seepage.
- Seepage occurring from country side to the river side, during and after flood recession, takes the finer bank materials along with it below the phreatic line.
- Thus the lower part of the bank collapses because of piping.
- This eventually may cause failure of the upper part due to lack of support.
- Such failure is more in a situation where water bodies exist in the country side near the river, as these lead to continuous seepage for longer period.
- Light weight vegetation having spreading root system can facilitate safe release of seepage water without carrying the soil particles along with.

# River bank erosion and vegetative practices

- Many a time any kind of protecting measures can be taken away by out flanking of the protected portion.
- To avoid this, a deflecting vegetative spur can be placed at up-stream of the protected portion with proper orientation.
- Anchorage of the vegetation may also become necessary particularly during initial growth condition.



# Case Study

- Based on the above understanding, bioengineering approach was adopted for controlling bank erosion of Dikrong River in Assam.
- With initiative of Mr. D.Hazarkia of Polygon Foundation, this NEDFi funded project was implemented under the technical guidance and support of IIT Guwahati (Sarma A.K., 2007) and encouraging results were obtained.
- Due to paucity of fund and non-availability biodegradable ecofriendly net, plastic net was applied for initial stability of the planted vegetation.
- To apply this concept in different suitable tributaries, a proper standardization and design guideline is necessary.
- IIT Guwahati is working for preparing standard guideline on vegetative methods of controlling river bank erosion

# Net and Bio-system



















# Conclusion

- Above analysis reveals that vegetation may have to be used in combination with other methods of bank protection.
- Types of bank materials, height of bank and cause of failure plays an important role in deciding type of vegetation and its way of implementation.
- We are working for developing a standard guideline for using vegetative measures for preventing river bank erosion.
- A practical site for medium size river if selected and some funding if generated for implementation, it will be much helpful in preparing the guideline.

**Thanks**