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Meghalaya Livelihood Improvement through Forest Enhancement

Meghalaya Basin Development Authority

Japan International Cooperation Agency

**No. MBDA/JICA/2023/12/1456** **Dated: Shillong, the 15th Jan, 2024**

From
The Additional Project Director
MegLIFE, MBDA, Shillong

To
The District Project Managers
MegLIFE, MBDA

Subject: Guidelines for Construction of Half Moon Terraces in the 2023 plantation sites under MegLIFE Project

It has been decided to treat the 2023 plantation area of 2845 ha raised under MegLIFE Project with Half-moon (Eye Brow) Terracing for soil and water conservation to ensure good survival of plantations.

2. Guidelines for construction of half-moon terrace and model cost estimate is attached at **Annexure-1 and Annexure-2** for your reference and necessary action.

Enclo: As Stated

(Gunanka DB, IFS)
Joint Secretary to the Govt. of Meghalaya
Additional Project Director
MegLIFE, MBDA, Shillong

Copy to:
1. The Project Director, MegLIFE, MBDA, Main Secretariate Building, Shillong-for favour of kind information
2. The Block Project Managers, MegLIFE, MBDA
3. Project Associates, MegLIFE, MBDA

-for necessary action

15/01

Technical Specialist, Project Management
MegLIFE, MBDA, Shillong

**Annexure-1**

## Guidelines for Implementation

Eyebrows/half-moons are small, semi-circular and stone-faced/bamboo/log-faced structures that open in the direction of the run-off. They can be built on steep slopes, usually with a maximum preferred slope of 50 percent.

The steeper the gradient, the more the bunds have to be reinforced in the downward toe and the higher the downward toe section becomes.

These are constructed on the slope to retain soil and moisture in the plantation areas to ensure better survival. These are made around saplings planted.

**Method of Construction**

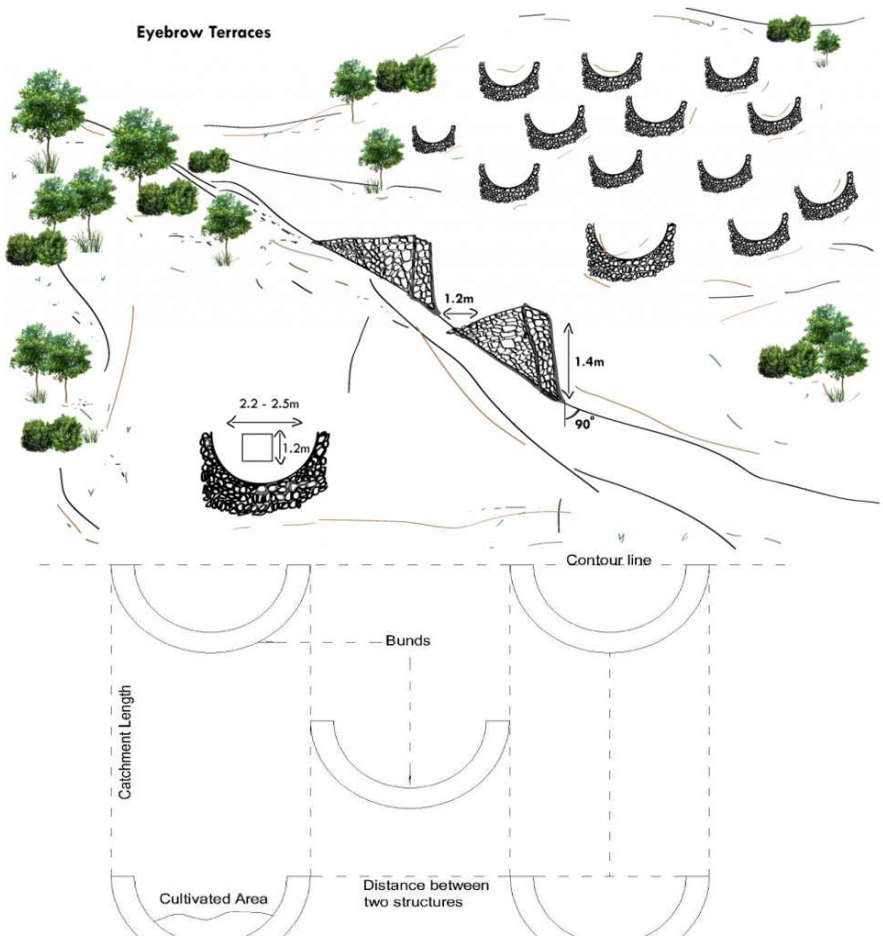
- Eyebrow terraces are usually built by scraping soil and stones together and putting them in place to form a ridge.
- The center of each pit functions as a great location for a tree/sapling.
- The catchment area (or the area of the micro catchment intervention, in this case the Eyebrow terraces) should always be larger than the cultivated area, in order to be able to collect sufficient water for the crops.
- The ratio between the catchment area and the cultivated area can vary between 2:1 and 10:1.
- For an eyebrow terrace intervention, if the cultivated area is 1-5 square meters, the catchment size should be at least 5-50 square meters.

Three types of materials could be used to construct eyebrow or half-moon terraces depending on the availability of the materials in the Project Villages.

i) Bamboo, ii) Logs iii) Boulders

**Process of construction with boulders-**

The eyebrow can be complemented by boulders strips, in particular on slopes that are relatively even and not too steep (<50 degrees). They are built from coarse stones and boulders (see figure below). These stone strips will slow down run-off, intercept sediment and built-up soil layers. They will stretch over the width of the slopes, allowing water to filter through, as they are permeable. See Figure below for layout and design of stone stripes.

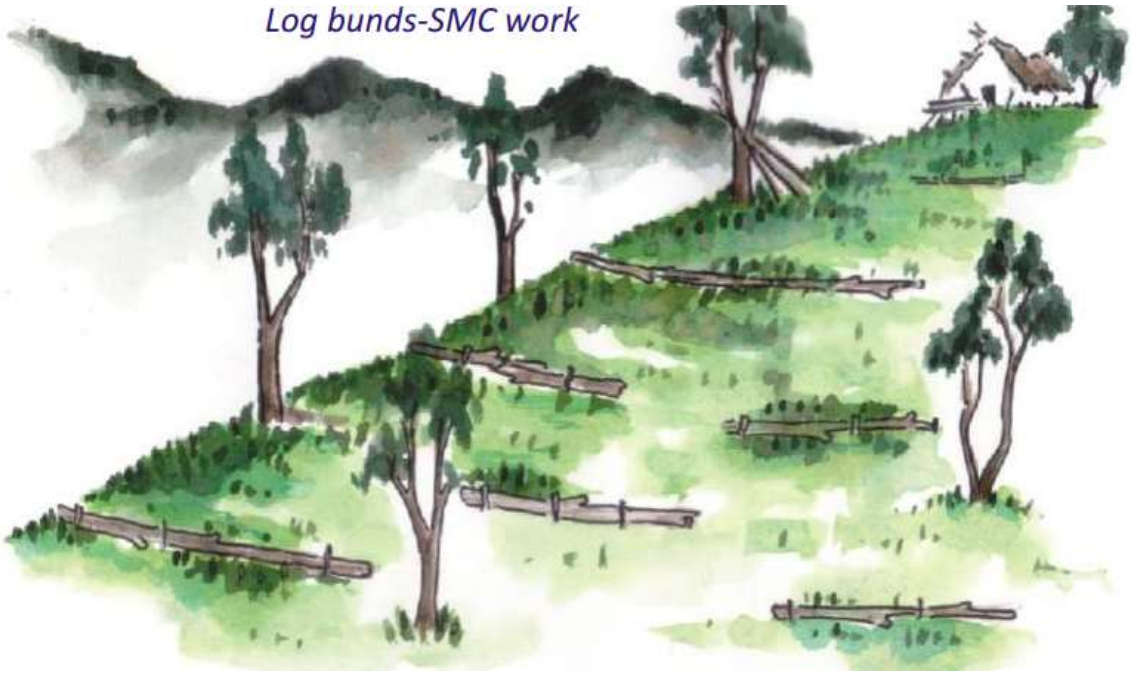



| Gradient % | Stone ring diameter | Inner cross width | Backwall height | Reinforced backwall |
|---|---|---|---|---|
| 30 | 30 cm | 220 cm | 70 cm | – |
| 45 | 30 cm | 180 cm | 120 cm | 10 cm |
| 60 | 30 cm | 140 cm | 180 cm | 20 cm |

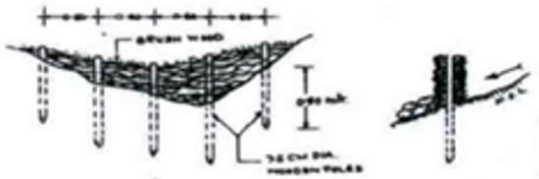
| Gradient % | Distance between lines of eyebrow terraces (m) |
|---|---|
| 30 | 15-20 |
| 45 | 10-15 |
| 60 | 8-10 |

**Process of construction with Bamboo/logs-**

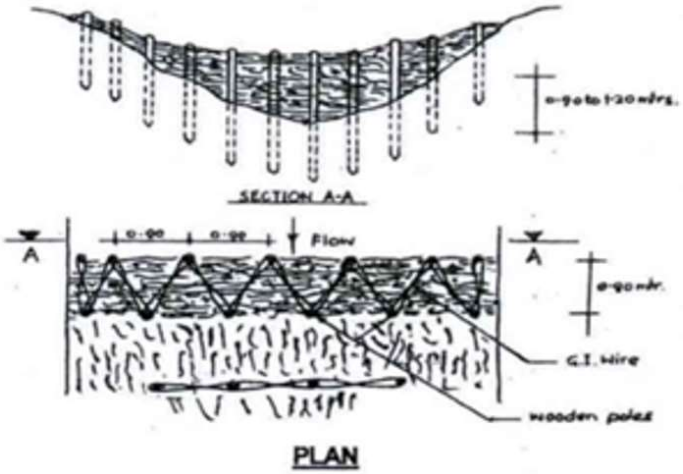
- Total No of poles – 10
- Length of poles – 6 Nos of 1.5 m; 4 Nos. of 1.0 m
- Diameter of poles for the vertical members: 8 to 10 cm.
- Interweaves – Split the bamboo in 4 sections. Chord length=$\sqrt{2}r$*r=7.1 cm
- The distance between interweaves – 2.5 cm.
- The interweaves can be of the thinner part of the bamboo.
- Insert 0.30 m in earth. Before inserting in earth coat the bamboo with coal tar or used mobile oil. The inserted part may also be sprayed with neem oil to prevent attack by termites.
- The coated part should be upto 0.15 cm above the ground. Thus, in all 0.45 cm to be coated.
- Logs can also be used instead of Bamboos, but these logs should be from lopping (no trees should be cut down



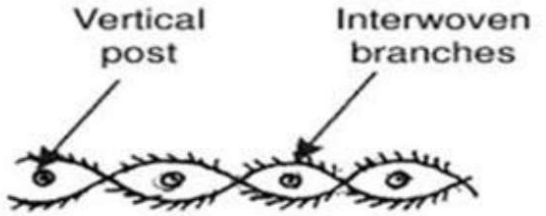
## SINGLE ROW BRUSHWOOD

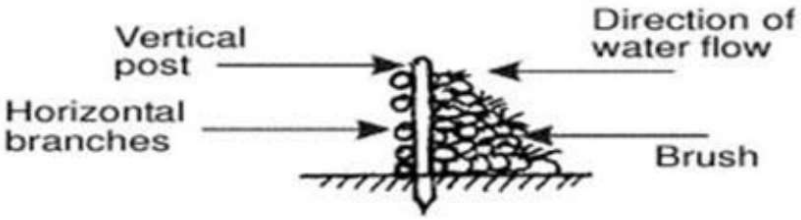


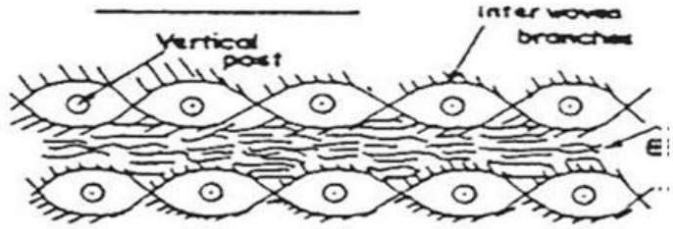
## DOUBLE ROW BRUSHWOOD



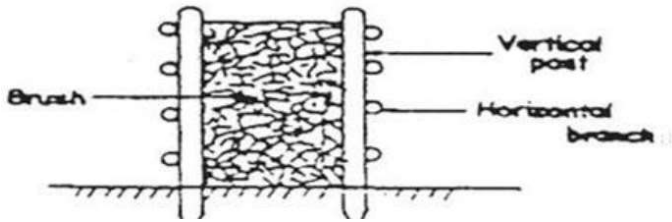

PLAN



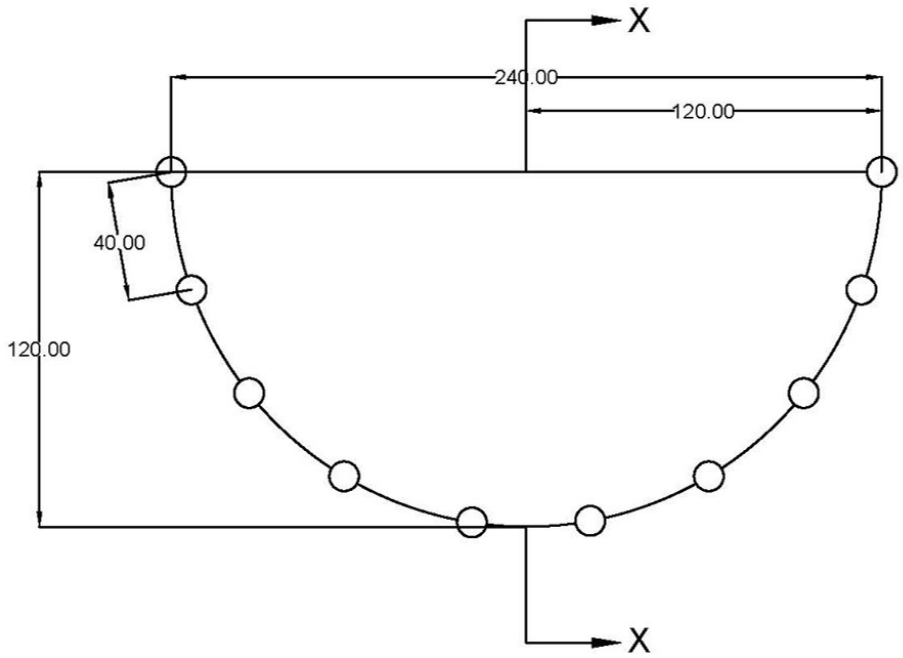




Cross Section



# EYEBROW /HALFMOON TERRACE (BAMBOO)

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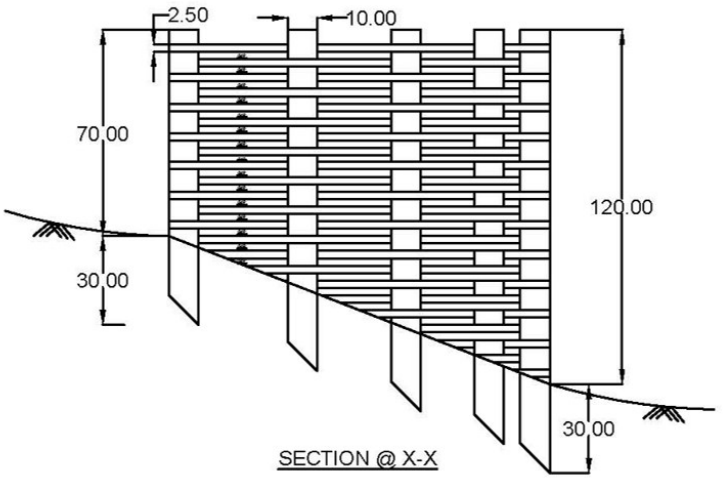


SECTION @ X-X

GAP-2.50cm
BAMBOO DIA-10cm

ALL DIMENSION ARE IN CENTIMETER.

Annexure-2

## Estimation for Half-moon Terraces (10ha) using Bamboo/Logs

| S.No. | Particulars | Quantity (Model 3) | Unit | Unit Rate | Total Cost (Model 3) (INR) |
|---|---|---|---|---|---|
| 1 | Distance between lines of Terraces | 15 | m | | |
| 2 | No of half moon terraces required for 10 ha Q/(V*f) | 667 | Nos. | | |
| 3 | Length of half moon terrace bund L(m) = 22/7*radius(m); Diameter of terrace=2.5m | 3.93 | m | | |
| 4 | No . of Poles required | 10 | Nos. | | |
| 5 | Length of bamboos required for poles | 13 | m | | |
| 6 | No of interweaves | 12 | Nos. | | |
| 7 | Length of bamboos required for interweave (Interweave of 4 m each/4) | 12 | m | | |
| 8 | Total Length of Bamboos required in one half moon terrace | 25 | m | | |
| 9 | Cost of Bamboo (@Rs 3.00/m) | | INR | 3 | 75 |
| 10 | Transportation/Cutting Charges of Bamboo (@ Rs. 0.10/m) | | INR | 0.10 | 3 |
| 11 | Excavation for the Poles | 0.024 | cum | 213 | 5 |
| 12 | Labour Charges (1/4 day) | | INR | 381 | 95 |
| 13 | Miscellaneous (Used Mobile Oil/Coaltar) @0.5% of expenses at S.No. 9,10,11,12 | | @0.5% | | 1 |
| 14 | Construction of half moon terraces by manual means using bamboo for 10 ha | | INR | | 119106 |
| 15 | Per ha cost | | INR | | 11911 |
| 16 | Per terrace cost | | INR | | 179 |

## Estimation for Half-moon Terraces (10 ha) using Boulders

| S.No. | Particulars | Quantity (Model 3) | Unit | Unit Rate | Total Cost (Model 3) (INR) |
|---|---|---|---|---|---|
| 1 | Volume of Half moon terrace bund V(cum) = 22/7*radius(m) * Average width (m) * Height (m) Diameter = 2.50 m, TW= 0.40m, BW=0.60m, Height = 0.5m | 0.491 | cum | | |
| 2 | Distance between lines of Terraces | 15 | m | | |
| 3 | No of half moon terraces required for 10 ha Q/(V*f) | 667 | Nos. | | |
| 4 | Volume of terrrace work in 10 ha Length of Half moon terrace x Sectional area | 327 | cum | | |
| 5 | Clearance of site - 19.24 (SOR-B) | 2.75 | sqm | 2 | 3770 |
| 6 | Loading and unloading rate /unit on the basis of SOR (1.1) (i&iii) | | INR/cum | 312.00 | |
| 7 | Labour Charges | | INR | 381 | 24 |
| 8 | Construction of half moon terraces by manual means | | INR | | 118018 |
| 9 | Total Cost (10 ha) | | INR | | 121788 |
| 10 | Per ha cost | | INR | | 12179 |
| 11 | Per terrace cost | | INR | | 182.68 |