

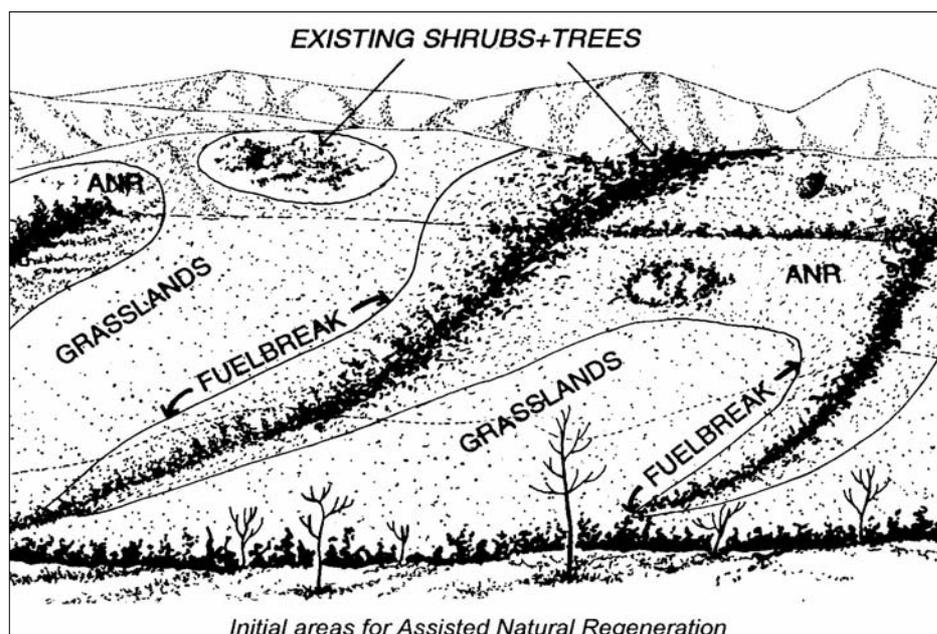
### 3. Assisted Natural Regeneration\*

#### 3.1 Justification

Assisted natural regeneration (ANR) is based on the ecological principles of community succession and is most applicable if there are patches of natural forest or trees mixed within the grassland. This method was proposed by Dalmacio (1986), and its basic concept emphasizes protection and nurturing tree seedlings and saplings already existing on degraded sites, rather than establishment of entire new forest plantations. In seriously degraded landscapes, ANR is not a feasible means for rehabilitation as it is likely that isolated trees do not produce viable seeds or vigorous seedlings.

Implementation of ANR can often be accomplished for as little as one-third of the cost of conventional reforestation. It is a flexible approach, and depending on the site, this method has potential to:

- Involve local people in rehabilitating a forest that meets their needs
- Reduce reforestation costs, as there is less site preparation and nursery establishment
- Develop a forest with many layers of native species, including shrubs and herbaceous plants, which maintain the original vegetation, and promote biodiversity conservation.
- Quickly restore forest cover to watersheds – multi-storey forests control soil erosion and increase the amount of rainfall absorbed through the ground.



Source: Kathleen et al, 1999.

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*This section was extracted and modified from Kathleen et al, 1999.*

## 3.2 Implementation

### 1) Select appropriate sites:

- Begin in areas that can be protected from fire.
- Consider the stage of plant succession at the site
- Choose sites with enough natural regeneration already present to meet objectives. Estimate the number of existing woody plants/hectare, including seedlings and saplings 15-200 cm tall. Count clumps of seedlings within one square meter as one plant. The guidelines given in Appendix 7 are for natural regeneration that is relatively well spread regardless of slope. If regeneration is uneven, use an estimate for large areas with less regeneration. To make a more careful estimate, use a tally sheet for sample plots (see example in Appendix 8).
- Choose sites close to forest patches: gallery forests, forest edges and patches of forest have seed bearing plants and seed dispersing animals. This increases the number of new wildings that can come into the ANR area. Soil conditions may also be more favourable near forest patches.
- After choosing the site, get to know it well: understand local people, the history of the area, local species, and local soil and rainfall.

### 2) Protect the area from fire and grazing

Since ANR is often implemented by communities rather than individual farmers, groups can be organized for fire control. At least a month before the beginning of the dry season, plans should be developed and the fire fighting crew organised.

Establish a one-year test comparing areas where grazing animals are kept out by a fence with areas where grazing animals are allowed to enter and spread seeds. Compare the results and adopt the better method.

### 3) Identify and mark woody plants

Place a stake next to the wilding. The stakes should be visible, about 1.5-3 cm in diameter and 1.5 m in height. Use stakes pruned from large trees or thinned from dense thickets.

### 4) Clear the grass and/or weedy species to at least 0.5m around each seedling or sapling throughout the site

### 5) Stimulate new natural regeneration

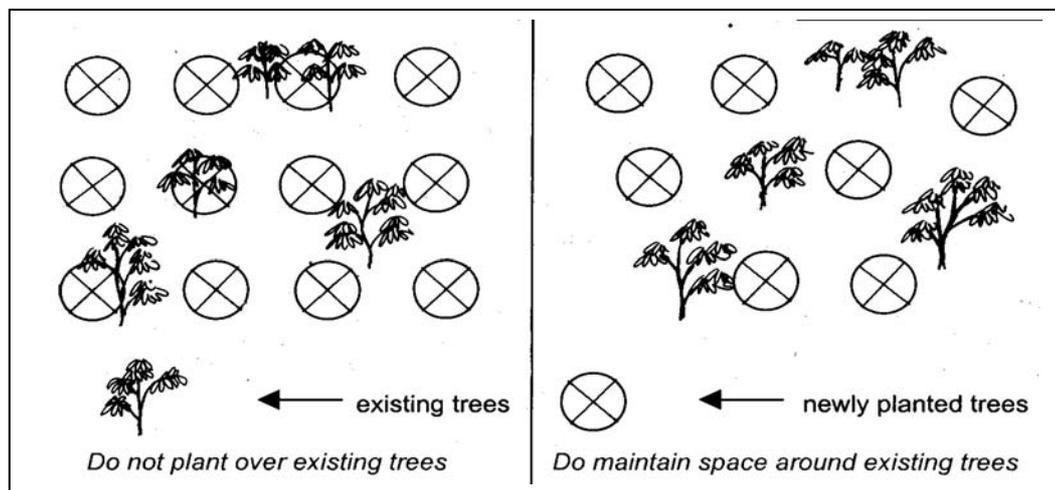
Brush grass near forest: near forest edges and tree patches, slash or spray herbicide on all grass and weeds within 5-20 m., nearby trees and forest wildlife will provide seeds.

Protect wildlife: develop mechanisms within the community and educate children not to kill forest birds and bats. Birds, bats, and pigs can carry seed into the degraded forest.

### 6) Help existing woody plants grow faster

- Mark new wildings as they come into the area.
- Clear weeds around the old and new wildings (ring weeds).
- Fertilize - fertilization depend upon species, size of seedlings, soil fertility, and plantation value. Before spending too much money on fertilizer, test its effects on different species and different age classes as in sample plots. To apply fertilizer:
  - Apply after ring-weeding.

- Apply in a spot, semi-circle, or circle about 15-20 cm from the tree.
  - For nitrogen-fixing seedlings, apply about 10g Phosphate (P) per tree. For other seedlings, apply about 20g Nitrogen (N) and 10g (P) per tree, or about one tablespoon NPK, (K=Potassium). These are general recommendations; if recommendations from local soil tests are available, they should be adopted instead.
  - For large trees: apply directly below the edge of the tree canopy, in a circle, semicircle, three spots.
- Thin – where two seedlings or saplings are close to each other, remove the one that is smaller, less healthy, or of less desirable species. When a tree stump has several sprouts, remove all but the 1-3 largest.
  - Transplant – Make use of planting materials from thinning operations. If thinning takes place during the wet season, transplant healthy thinned wildings to nearby areas.
- 7) Continue to clear grass and/or weedy species  
Repeat clearance of weedy species which compete with the seedlings every 2-3 months. Be careful not to remove shade from the wildings that need it. Throughout all activities, look for new natural regeneration, to be marked and ring-weeded.
- 8) Enrich by planting light demanding species  
Enrichment planting can include cover crops, orchard trees, and commercial tree species.
- Site: Along the edges of existing forests, and in gaps between patches of large trees. These areas have more fire protection than open areas, more shade, and possibly better soil conditions. Each planting season, follow the edges of recently planted areas.
- Species: Try to use a wide variety of local native species matched to different spots of the areas. Include native tree species that provide fruit for birds and bats that spread seeds, for example, *Syzygium cumini* (Pring), *Parinarium anamensis* (Thlok), *Irvingia oliveri* (Chambak). If possible, plant a few target species in different sites as a test. Observe how they grow or adapt to different conditions. Select the species that grow the best for each site.



Source: *Kathleen et al, 1999.*

Implementation: Many planting techniques are the same as those for simple tree plantations (see Appendix 4).

Spacing: Spacing depends on the species and objective of the site. Maintain spacing between new trees and existing natural regeneration.

Seedling production. To estimate the amount of planting material needed, subtract the average woody plants/ha already present from the target stocking. For example, 2m x 3m spacing is about 1,670 trees/ha. If the area already has 600 wildings/ha, 1,070 seedlings/ha will be needed, plus an allowance for mortality.

9) Enrich by planting shade-tolerant species

Begin enrichment planting of shade tolerant species as soon as nurse trees and existing woody species cast appropriate shade.

At the start of the wet season, plant the high-value tree species between the nurse trees at 3 x 3m or 4 x 4m spacing, or at the recommended spacing requirements of each species. Bamboos, rattans, orchids, and other species that produce non-timber forest products can also be planted.

*Please refer to Appendices and Annex below:*

Appendix 1 – Species selection

Appendix 2 – Seed procurement

Appendix 3 – Nursery operation

Appendix 5 – Tending the plantation

Appendix 6 – Guideline for decision making in reforestation

Appendix 7 – Simple sampling for density and species for natural regeneration

Appendix 10 – Some tree species producing non-timber forest product

Annex 1 – Seed requirement calculations

## **4. Framework Species Method**

The framework species method of forest restoration is designed to restore diverse forest ecosystems on degraded forestland for biodiversity conservation or environmental protection.

When an area has been heavily degraded and normal planting could hardly restore the forest ecosystem, it is therefore, of great benefit to use a technique called "framework species". Framework species are fast growing with dense shading crowns that rapidly shade out competing weeds, and attractive to seed dispersing wildlife, especially bats and birds.

The method depends on some tract forest patches or remnant forest trees, surviving fairly closed to planted plots, to provide a source of seeds. In addition, reasonably dense population of seed dispersing animals must occur in the vicinity. This can be achieved by planting a mixture of 20-30 native forest species (including fruit bearing species). Tree planting restores basic ecosystem structure and function, whilst seed-dispersing wildlife re-establishes biodiversity and the original tree species composition of the forest. If either of these two elements is missing from the surrounding landscape, natural regeneration within framework species plots may be unreliable. On such sites, if the initial planting of framework tree species failed to stimulate natural regeneration, subsequent planting of additional tree species may be necessary (see Pictures in the following pages).

*Please refer to Appendices and Annex below:*

Appendix 1 – Species selection

Appendix 2 – Seed procurement

Appendix 3 – Nursery operation

Appendix 5 – Tending the plantation

Annex 1 – Seed requirement calculations