RECOMMENDATIONS, MAJOR FINDINGS AND AREAS FOR FURTHER STUDIES

Among the hills of the Eastern Ghats in Tamil Nadu, the Shervarayans face several threats endangering the fragile ecosystem and diversity. The elaborate investigations conducted during this period would lead to formulation of some concrete plans of action, which this section would touch upon. It would also highlight major findings of this study.

Issues of conservation

These issues need to take into account the involvement of natives and their whole hearted participation. Conservation would succeed when it is seen together with economic development.

Economic development

The tribal populations in the Shervarayans procure less for their livelihood from their agriculture fields and are therefore forced to labour in the coffee estates to secure economic stability. In such a situation, adoption of poverty alleviation schemes such as agroforestry programmes and others become relevant. Besides enabling to attain economic security the surplus yield from the above operations could be sold through community 'shops' which would fetch them sustainable income. Agroforestry would also improve the soil conditions and enhance water regimes. It is with this focus that certain potential sites for agroforestry and floriculture have been recommended. Tribals could be encouraged to form a network among them to strive towards attaining sustainable livelihood.

Potential sites for Floriculture, Agroforestry and Reforestation

Moderate and less potential areas with land capability classes of 7-9 would be ideal for the above programmes. Utilization of these lands could rectify the soil and enable enhancement of water retention. Portion of land which have become fallow/ wasteland, should be reclaimed by proper application of groundwater recharge technologies and soil conservation measures.

Water conservation

Although Shervarayan hills receive maximum rainfall, it does not reach the natural aquifeir, since the sloping nature of the hills are prone to increasing runoff leading to severe soil erosion. Temporary water bodies (ponds) are not adequate to recharge the aquifer. Hence the available option is the adoption of artificial groundwater recharge technologies, which would enhance the ground water potential besides improving the ground water quality too.

Soil conservation

The problem of soil erosion is a challenge to be looked into. Conservation measures involving contour bunding, terracing, vegetative bunding with *Vetiveria* *zizanioides, and Agave americana*, soil mulching with mulch crops during the rainy season would be effective in this regard. Soils affected by factors such as acidity can be reclaimed by the application of lime or dolomite and repeated ploughing with heavy implements. Disc plough will reduce the problem of gravelliness and increase the infiltration of rainwater, thus reducing the runoff and subsequently arresting or minimizing the soil erosion.

Recommended plants for floriculture

The following plants could be tried

Roses, Chrysanthemum, Carnation, Gladiolus, Tuberose, Gerbera, Lilies, Narcissus, Daffodils, Sweet sultan, Larkspur, Stock, Aster, Sweet pears, Antirrhinum, Bells of Ireland, Gypsophilla and Golden rod. These have been singled out based on their market value, storage capabilities and survival rate.

Agroforestry

The potential sites for Agroforestry have already been demarcated. The following operations would suffice thr process.

i) **Horti-silviculture**: This system exists today mostly on the slopes but without irrigation facility. The nature of the slope is such that it is not suitable for agriculture but can sustain horticulture or kitchen gardens. However the system is useful for the production of fruits in a limited scale.

ii) **Agro-silviculture on sloping lands**: This system can be adopted by natives residing in the mid or at the foothills of mountains. Since the areas are totally devoid of vegetation and suffer from scorching heat during summer and drought conditions especially during summer. The natives can raise forest tree species around their farm, which serve both as boundaries and provide much needed fuel and fodder.

iii) **Boundary plantation**: Natives can be encouraged to grow species of Salix and grasses like *Imperata cylindrica* (Strong soil binder) on the boundary of their paddy fields and on roadside. Planting the same on canal banks passing through the fields can reduce flooding.

iv) **Multipurpose forest tree production systems:** Systematic tree plantations to meet the demands of fuel, fodder and fruit needs to be given priority. Such a forestry programme could be adopted in all areas.

Choice of species for Agroforestry

These recommended species are mostly native to Shervarayans

i) **Timber:** *Shorea roxburghii, Ceiba pentandra, Sterculia foetida, Garuga pinnata, Aglaia elaeagnoidea, Trichilia connaroides, Toona ciliata, Chukrasia tabularis, Celastrus paniculatus, Buchanania lanzan, Mangifera indica, Lannea coromandelica, Dalbergia sissoo, Pterocarpus marsupium, Delonix elata, Hardwickia binata, Terminalia chebula, T. paniculata, Anogeissus latifolia, Syzygium cumini, Alangium salviifolium, Viburnum punctatum, Mitragyna parvifolia, Ixora pavetta, Olea dioica, O.glandulifera, Ligustrum gamblei, Dolichandrone arcuata, Myristica fragrans, Persea macrantha* and *Neolitsea zeylanica.*

Pandey *et al.,*(1965) recommended the following species of grass+ legume mixture under special situations.

ii) **For cut-Fodder:** *Panicum antidotale* + *Indigofera hirsuta, Panicum antidotale* + *Calapogonium orthocarpum, Panicum antidotale* alone, *Cenchrus ciliaris* + *Calapogonium orthocarpum, Cenchrus ciliaris* alone, *Pennisetum polystachyon* + *Indigofera hirsuta, Pennisetum polystachyon* + *Calapogonium . orthocarpum, Pennisetum polystachyon* alone,

Pennisetum pedicellatum + Indigofera hirsuta, Pennisetum pedicellatum + Calapogonium orthocarpum and *Pennisetum pedicellatum* alone.

iii) **For grazing**: *Cenchrus setigerus + Indigofera hirsuta, Cenchrus setigerus + Calapogonium orthocarpum, Cenchrus setigerus* alone, *Dichanthium annulatum + Indigofera hirsuta, Dichanthium annulatum + Calapogonium othocarpum, Dichanthium annulatum* alone, *Cenchrus ciliaris + Indigofera hirsuta, Cenchrus ciliaris + Calapogonium orthocarpum, Cenchrus ciliaris* alone, *Urochola mosambicensis + Indigofera hirsuta, Urochola mosambicensis + Calapogonium orthocarpum* and *Urochola mosambicensis* alone.

Recommended species for Reforestation

Several species could be thought of as suitable for reforestation. Natural regeneration capacity of the forest species can be enhanced if the forest department would choose the following species.

Ligustrum gamblei, Syzygium cumini, Olea glandulifera, Elaeocarpus serratus, Bischofia javanica, Neolitsea scrobiculata, Linociera ramiflora, Alangium salviifolium, Memecylon edule, Commiphora caudata, Pongamia pinnata, Diospyros montana, Buchanania lanzan and *Streblus asper.*

Coffee estates and biodiversity conservation

Major portion of the Shervarayan hill tops have been taken over for coffee estates. Coffee based agroforestry system for conserving the tree biodiversity is recommended since the canopy cover acts as a reservoir of local species, some times with high biodiversity value. Native tree species acting as shade hold great

promise towards integrated conservation strategy. This trend is seen in most of the coffee estates on the Shervarayan hills and some of the rare and endemic tree species thrive here. A list of such species is listed in **Annexure III**. The high incidence of exotics such as *Grevillea robusta*, in coffee estates has added certain disadvantages, since they are periodically, felled to fulfill fuel or timber needs. In this process, native tree species also are cut together with exotics. Several native tree species in the estate are evergreen. Hence it is recommended to promote coffee based agroforestry by planting indigenous tree species in coffee estates thereby conserving biodiversity. The canopy cover also provides considerable organic matter and prevents soil erosion.

Conservation of other land areas

These are patches of land, which lie adjacent to or in the vicinity of mining areas/dumps. The fragile ecosystem of the Shervarayan is under heavy biotic pressure and measures of restoration and conservation has already been discussed in Chapter V. The remnants of forest patches hold certain categories of species, which have affinity with those, encountered in the Western Ghats. The unique ecosystem of the Shervarayan would face the brunt of extinction (degradation) sooner or later if intensive conservation measures are not introduced.

❖ Six major vegetation types have been identified using satellite imagery of IRS 1C LISS III of the year 1999

❖ Woody species diversity shows that the all vegetation types are distinctly diversified

❖ The relationship between each vegetation type with rainfall, slope, altitude and hydrogeomorphology has been established. Rainfall determines vegetation types and not species composition. Altitude determines the species composition and slope affects the tree girth

❖ Forest cover changes analyzed for a span of 20 years throw light on the biotic pressure the forest is subjected to. There is a drastic decrease in the areas occupied by dense and open forest categories. Forest cover near habitations and adjacent to road network have been more affected by biotic pressure than from other areas

❖ Detailed evaluation of an endangered ecosystem (an unprotected component) has been analyzed, which holds nearly 226 species of vascular plants. These are indications that the natural forest will be drastically altered, in near future also

❖ Conservation priority areas have been identified together with proposals for their development involving people's participation

There are other aspects, which need to be studied in the Shervarayans

❖ Micro level planning of forest resources using RS and GIS

❖ Habitat suitability analysis of native plant species through GIS

❖ Identification of fire-risk potential zones and evolving possible prevention strategies using GIS

❖ Phenological variation for different seasons using satellite imagery

❖ Identification of canopy gap areas (woodland ecology) using satellite imagery

❖ Identification of potential lands for soil erosion using GIS

❖ Quantitative analysis of forest using remotely sensed data *i.e.* Leaf Area Index (LAI), Leaf Nitrogen Concentration (LNC) and above ground biomass