



Guidelines & SOP's **on** **Forest Management in West Bengal**

DIRECTORATE OF FORESTS
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**WEST BENGAL
AFFORESTATION
GUIDELINES**

Introduction

Forests are home to innumerable species of flora and fauna, constituting a significant part of biodiversity of any district/state/nation. Forests are also home to millions of forest dependent people, especially the tribals, who are totally dependent on forests for their livelihoods.

Sustainable management of forests has been a challenging task since ancient times and the importance is felt more in recent times. Growth in human population and meeting its developmental needs such as expansion of agriculture, power projects, mining, roads and developmental projects for human needs result in deforestation and degradations of forests.

After the formulation of National Forest Policy, 1988, there was a change in the attitude in forest management which emphasized on the imperative need of Joint Forest Management. The implementation of JFM in West Bengal improved the quality of forests especially in South West Bengal in a significant manner and consequently the utilization of forest produces for the benefit of both forest dwellers and the government. This resulted in increase in plantation activities since 1990's. The department has gained lot of experiences by way of feedback and evaluation of the afforestation program. Many successful planting techniques have been established and followed in the field. Afforestation is one of the core activities of the department and there is an urgent need to codify successful practices, so that it serves as manual for all the field officers who are engaged in the task of afforestation. As per National Working Plan Code, 2014, enhanced carbon sequestration through recognized and innovative silvicultural practices, eco-restoration of degraded/mined out forest land, to improve biomass productivity and thereby improving forest health and vitality should be one of the major objectives of planning forest management.

Need for planting more trees

The need for planting more trees to increase the green cover needs no explanation. Trees are essential to life on earth. They create the very air we breathe and filter air pollution. Trees also build soil and help soak up storm-water before it can create a flood, and offer energy-saving shade that reduces global warming and create and shelter the habitat for thousands of different species. Trees also help to reduce ozone levels in urban areas. Most importantly, trees sequester carbon, helping to remove carbon dioxide and other greenhouse gases from the air, which cools the earth. The carbon storage capacity of forests is approximately three times as large as the pool of carbon in the atmosphere. If forests are degraded, reduced or eliminated, the captured carbon will go back into the atmosphere as *Carbon Dioxide (CO₂)* and create untold miseries on humanity. The purpose of these guidelines is, therefore, to conserve and improve the present state of forests under government control and expand tree plantations outside the notified forest areas.

Background

In order to have a comprehensive vision for increasing the Forest and Green Cover it is necessary that we have a knowledge of Agro-Climatic Zones and their present status of forest cover and problems in different districts of the state in order to formulate a proper strategy. West Bengal is divided into six Agro-Climatic Zones namely:

Agro-Climatic Zones of West Bengal

- a) **Northern Hill Zone** This is mainly confined to two districts i.e., Darjeeling and Kalimpong. The Recorded Forest area in these two districts are 39.87% and 35.47% respectively of the total geographic area which is over and above the targeted 33% of the area as envisaged in National Forest Policy, 1988. The major problem is soil loss, water scarcity and landslides due to unsustainable population pressure.

- b) **Terai Teesta Alluvial Zone** This zone spreads into four districts namely Jalpaiguri, Alipurduar, Coochbehar and Uttar Dinajpur. The zone is crossed by the large perennial Himalayan rivers Teesta, Torsa, Jaldhaka, Raidak, Sankosh, Mahananda etc. that have each built alluvial fans covering large areas below their exits from the hills. The soil in the Terai is alluvial and fine to medium textured. Forest cover in the Terai and alluvial areas have decreased gradually after independence due to agricultural usage over the period. The recorded Forest area in the four districts 25.42%, 31.54%, 1.06% and 0.19% respectively.
- c) **Vindhyan Alluvial Zone** This zone is confined to two districts namely Dakshin Dinajpur and Malda. The respective Recorded Forest cover of the two districts is 0.37% and 0.45% respectively. The soil is deep alluvial and fertile.
- d) **Gangetic Alluvial Zone** This zone encompasses Murshidabad, Nadia, Purba Bardhaman, Paschim Bardhaman, Howrah, Hooghly, parts of North 24 Parganas, Purba Medinipur and South 24 Parganas. The Soil is very fertile and deep alluvial silt. The percentage of Recorded Forest Cover in these districts are 0.14%, 0.31%, 3.69%, 0%, 0.11%, 0.02%, 0.40% and 42.38% respectively.
- e) **Undulating Red and Laterite Zone** The zone is spread across Birbhum, Purulia, Bankura, Jhargram and Paschim Medinipur Districts. The Recorded Forest areas in these districts are 3.52%, 14.75%, 20.81% and 19.03% respectively. The landscape is fragmented into forest areas and agricultural spreads. The forest soil is not very fertile and mostly lateritic in nature.
- f) **Coastal Saline Zone** This zone is confined to Purba Medinipur and south 24 Parganas districts. The respective forest cover is 0.40% and 42.38%. The soil is saline and not very fertile.

Objective

1. To enhance green cover over barren and degraded areas, improve light and moderate canopy areas to dense forest.
2. To restore the wilderness of the forest and provide natural habitat to the wildlife.
3. To increase the productivity of the forest by selection and using quality planting material.
4. To consolidate joint forest management with local people, sharing usufructs in terms of major and minor forest products and medicinal plants.
5. Conservation of biodiversity and ensure carbon sequestration to achieve the NDC target.
6. Improve soil and moisture regime, prevent soil erosion and management of the watersheds.
7. Promote tree planting outside forest, make it more economic, shorter rotation, develop agro-forestry, enhancing the socio-economic status of the population.

PREVAILING SCENARIO AND ISSUES

Status

- 1) **Northern Hill Zone** This is mainly confined to two districts i.e. Darjeeling and Kalimpong. The major problem is soil loss, water scarcity and landslides due to unsustainable population pressure.
 - i. Water scarcity and rapid rise in settlements in the hilly areas. This has resulted in increase in landslides and soil degradation inside and outside the forests.
 - ii. Weed infestation – Wide opening in the canopy encourage infestation with maling bamboo which resulted in

lack of natural regeneration and also cultivation of Phuljharu.

- iii. Legacy exotic species plantations – Legacy plantations of exotic species, like *Cryptomeria japonica* in North Bengal Hills are incompatible with prevailing objectives and future management strategy.
- iv. Improper Watershed management – Not managed under proper watershed management plan, which is necessary for soil and moisture conservation.

2) **Terai Teesta Alluvial Zone** This zone spreads into four districts namely Jalpaiguri, Alipurduar, Coochbehar and Uttar Dinajpur. Forest cover in the Terai and alluvial areas have decreased gradually after independence due to agricultural usage over the period, damage caused by eroding rivers and added problems from surrounding Tea Gardens. The present status may be categorised as-

- i. Forest degradation and weed infestation - Forests have degraded, due to illegal tree felling, firewood collection, uncontrolled grazing. Incidents of seasonal strong winds also add to the loss due to wind fallen trees. The younger crop is also damaged due to wildlife grazing. Over the years gaps due to tree loss have been overwhelmed by weeds. Consequently, forest habitat quality is either deteriorated or deteriorating very fast.
- ii. Sal mortality in plantations - Sal mortality in plantations is a cause of concern. Inadequate techniques in recent years, deterioration of soil conditions, constraints of labour skills in Sal sowing techniques have resulted in failure in raising healthy Sal plantations. This is exhibited as strip gaps in the failed Sal sowing lines in plantations.
- iii. Widening of torrents/rivers alongside during their journey from hills to plains thus intruding into the forest landscape and subsequent degradation of forests alongside.
- iv. Flash floods, meandering nature of the river course, silt deposition over large tract cause damage to the forest and change in the composition of the crop.

3) **Vindhyan Alluvial Zone** This zone is confined to two districts namely Dakshin Dinajpur and Malda. The respective Recorded Forest cover of the two districts is 0.37% and 0.45% respectively. The soil is deep alluvial and fertile.

- i. The recorded forest cover is very less – almost nil in the districts of this zone.
- ii. The land use is mostly agricultural with human settlements.

4) **Gangetic Alluvial Zone** This zone encompasses Murshidabad, Nadia, Purba Bardhaman, Paschim Bardhaman, Howrah, Hooghly and parts of North 24 Parganas, Purba Medinipur and South 24 Parganas. The Soil is very fertile and deep alluvial silt. Except South 24 Parganas and Paschim Bardhaman, the recorded forest cover is very less – almost nil in the districts of this zone. The land use is mostly agricultural with human settlement both urban and rural areas.

5) **Undulating Red and Laterite Zone** The zone is spread across Birbhum, Purulia, Bankura, Paschim Medinipur and Jhargram districts. The landscape is fragmented into intermittent forest areas and agricultural spreads. Fragmented forest, intermittent human habitation with the migratory wild elephant herd make a complex system with number of problems over the area.

- i. The whole tract is managed under Sal coppice and development with QGS, having shorter rotation for quick benefit with the help of JFMCs. The area was totally degraded prior 1990 and rejuvenated adopting joint forest management with the neighbouring villagers. Prior to 1990's due its degraded nature, there was no presence of elephants in this region.
- ii. However, owing to success achieved in reviving the forests with the help of JFMC's which was pioneered in

West Bengal, the elephants started coming to the region.

- iii. Continuous presence of resident elephant and prolonged presence of migratory herds, resulted Human Elephant Conflict which is a major issue in this zone.
 - iv. The usufruct share for JFMC members should also be kept in view for planning the new afforestation strategy. Newer plantation concepts of plantation of Red Sanders and Sandalwood Plantations in this tract may be considered and planned in order to replace and supplement the short rotation crops. Gradual removal of Akashmoni should be taken with priority.
 - v. Large tract of exotic monoculture, mainly with Akashmoni (*Acacia auriculiformis*) and *Eucalyptus* spp., affected biodiversity status of the area and degrade wildlife habitat.
 - vi. Due to dry nature of the forest landscape, almost all the small rivulets and springs are of seasonal in nature. This results in fire incidents in the drier and hotter seasons, damaging the NTFP and other natural resources.
- 6) **Coastal Saline Zone** This zone is confined to Purba Medinipur and South 24 Parganas Districts. The respective forest cover is 0.40% and 42.38%. The soil is saline and not very fertile.
- i. The recorded forest cover is very less – almost nil in the district of Purba Medinipur.
 - ii. The land use is mostly agricultural with human settlements.
 - iii. Frequent occurrence of cyclones.

ROADMAP

1) Northern Hill Zone

Water Scarcity, rapid rise in human settlements and legacy of exotic species in parts of hills require solutions for improving the quality of forests, revival of lost streams and for the reduction of landslides and soil erosion in the landscape.

Proposed Interventions

- i. **Catchment Area Treatment** - Study, preparation and implementation of Catchment Area Treatment Plans for soil and moisture conservation measures. All the future plantations to be taken up in these areas shall have to be implemented after preparing CAT Plans. A comprehensive implementation plan to be prepared of Soil conservation measures which will include identifying the erosion prone areas, planning the effective barriers and structures for prevention of soil loss such as bench terraces, check dams, embankments, culverts etc. The lost drainages of macro and micro watersheds are to be identified and necessary treatment plan to be adopted. This will be supported by plantations of local species around the areas as per the requirement of CAT Plans.
- ii. **Reclamation of weed infested areas** – Survey and demarcation of Maling infested area is to be done on priority basis and removal plan to be researched and formulated. Some works has already been undertaken for removal of Maling and reclamation of that area by planting local species. The result of such works may be considered to formulate a protocol and to be adopted over next few years to remove Maling from Hill forests. The value of Maling bamboo in soil conservation is to be kept in mind while formatting the protocol. Similar action may be considered for Phuljharu plantations inside forest area.
- iii. **Removing Legacy exotic species plantations by planting native species** – Legacy plantations of exotic species, Dhupi (*Cryptomeria japonica*) are incompatible with prevailing objectives of increasing biodiversity and local species and future management strategy. They have to be substituted with quality plantations of indigenous species.

Plantation guidelines

- a. **IN CAT Plan Areas** The plantations shall be done in accordance with the recommendations of CAT Plans

with only condition that all the plantations to be raised will be through one and half years old nursery grown seedlings with a maximum spacing of 2 x 2 meters. As most of the treatment will be done for soil and moisture conservation, close spacing is recommended along with grass and other soil binder species.

- b. The water harvesting structures shall have a comprehensive plantation plans especially around the outlets of the water source to prevent soil loss. The plantations shall be done in accordance with the plans prepared for such structures with only condition that all the plantations to be raised will be through one and half year-old nursery grown seedlings with a maximum spacing of 2 x 2 meters or 3 x 3 meters.
- c. Legacy plantations like Dhupi (*Cryptomeria japonica*) should be slowly replaced with local species found in the region and as per Hon'ble Supreme Court's Guidelines.

Species

Local species of hills suitable for the particular altitude and gradient shall be chosen. Noutside species that are not native to the hilly regions shall be selected for plantation purpose.

Nursery

Seeds/regeneration materials should be collected from selected seed sources. 1.5 to 3.5 year old seedling to be grown in poly pot (minimum 2000 cc). The slow growing species shall be maintained in the Nursery for two and half years before sending it for plantations.

Creation

Land preparation to be done in advance and application of soil ameliorants based on the status of available soil nutrients.

Spacing- as per the recommendation of CAT Plan and a maximum of 2 x 2 meters for tree species, since tall seedlings will be available for plantations.

3 Cleaning and 2 mulching are to be done along with application of fertilizer as per the prescription of Soil Test Report.

Barbed wire fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for three years after its creation and all casualties to be replanted with proper seedling.

2) Terai Teesta Alluvial Zone

This zone spreads into four districts namely Jalpaiguri, Alipurduar, Coochbehar and Uttar Dinajpur. The Terai is crossed by the large perennial Himalayan rivers Teesta, Jaldhaka, Torsa, Raidak, Sankosh, Mahananda etc. that have each built alluvial fans covering large areas below their exits from the hills.

To prevent continuous degradation due to anthropogenic and natural causes, it requires some attention and concern in the present afforestation practices.

Proposed Interventions

- i. **Forest degradation and weed infestation** - Reclamation of degraded and weed infested areas by removal followed by restocking with local species of trees, shrubs and bamboos as per the site quality. Target is to increase green cover, productivity to consolidate JFM System with special emphasis on medicinal plants and NTFPs.

Improving habitat quality for the wildlife.

Pilot projects for enrichment through seedlings/grass of indigenous species is, therefore, essential for habitat amelioration or clear felling and de-novo plantations in such areas are recommended.

- ii. **Sal mortality in plantations** - Creation of Sal plantations with proper protection and tending operations and reviving the older plantation plots which suffered badly due to Sal mortality.
- iii. Stabilization of river banks and flood plains for soil and moisture conservation and protection of the riverine forests. The area is to be treated after doing proper soil conservation structures and embankment protection. The flood plains is to be planted with riverine species, especially with Khair-Sissoo and their associates.
- iv. Habitat improvement for wildlife and to enhance biodiversity indexes by adopting underplanting, enrichment plantation and reclamation of high forests.
- v. Economic miscellaneous species plantation. Valuable timber species mainly Teak may be used for shorter rotation by using clonal material for regeneration. There are issues with Teak, as exotic. To sustain the joint system of management, it is necessary to increase productivity by minimum area inside the forest. Teak is a high priced general utility timber and it may be continued to use in planting.

Plantation Guidelines

I. For reclamation of degraded and weed infested sites

Sites which have a canopy density between 10 – 25%, deficient in regeneration, weed infested and with large open gaps are selected under this model. The presence of appreciable root stock of native species which can be nursed / nurtured to better health and supplemental planting with high value native species is main objective of this model.

- Degraded and weed infested areas treatment- Identified area is surveyed and demarcated and the area is closed with CPT or barbed wire fencing, whichever is suited. SMC works are taken up as per the field situation. Eradication of Weeds is to be done and the area is to be planted with tall seedling of 2-3 years and even more older saplings may be transplanted collecting from un-thinned plantations. Depending upon the status of degradation, choice of species may be done including grass and bamboo. The principle of treating weed infested area mainly with *Eupatorium* spp. and *Lantana camara* is to close the canopy as soon as possible. So close spacing, maximum 2 x 2 meters is suitable.
- Reclamation of Natural Forests – Enrichment planting using local composition of species and the steps of assisted natural regeneration may be adopted to get a normal forest. It was practised under different schemes, but a standard protocol to be developed for this landscape.
- Transplanting of large sapling (up to 10 years of age, collected from congested growth due for thinning) to the problem areas.

Species

Local species suitable for the particular gradient shall be chosen. No outside species that are not endemic to the region shall be selected for plantation purpose.

Nursery

Two and half years old homegrown seedlings in hycopots or polypots shall be raised before plantations. The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next two Financial Years twice from April to March will be taken up to plantation sites for plantations. The slow growing species shall be maintained in the Nursery for three and half years before sending it for plantations. Every division will have separate areas for normal two and half year-old

seedlings and for three and half year-old seedlings for such areas.

Creation

Land to be prepared along with SMC works and adequate soil ameliorants to be used as per the soil nutrient status.

Spacing: - 2x2 meters, to close the canopy as soon as possible to arrest weed growth.

3 Cleaning and 2 mulching should be done along with application of fertilizer.

Barbed wire fencing/energised fencing may be taken up in areas having high biotic pressure or wildlife areas.

Maintenance

The plantation shall be maintained for three years and regular infilling to be done with proper seedling/sapling.

II. Sal Plantations

Techniques for raising successful Sal plantations have been well established in North Bengal since the British era. The reasons behind failed Sal lines are biotic interference and wildlife. It is proposed that electric fencing around the plantation sites for Sal plantations may be taken up on a pilot basis and if successful may be replicated. The plantation methods for other miscellaneous species shall be same proposed for miscellaneous species plantation. The following improvements/changes are suggested for ensuring success of Sal plantations in North Bengal:

Mechanised harrowing of Sal lines - Establishment of Sal seedlings depends a lot on soil looseness/compactness in the root zone. At least 30 x 30 cm cross section of soil profile along Sal seed sowing rows need to be thoroughly pulverised in order to support vigorous root growth during first monsoon of the plants. Forest villagers used to do this job meticulously which led to vigorous growth of seedlings during first monsoon. Currently, in attempt to get more work output and to avoid heavy physical effort, labourers are doing shallow harrowing with insufficient pulverisation of soil and breaking of clods. The total work of Sal row harrowing needs to be done mechanically to get quality of soil work uniformly.

Hand weeding of Sal rows - Newly germinated Sal seedlings face intense competition from weeds. If Sal rows can be kept weed free during initial four months, there are high chances of their successful establishment. Proper hand weeding each fortnight i.e., eight times during June-October can be very useful in ensuring success of Sal plantation.

Protection from Wild animals, especially Elephants - Tender leaves of Sal and roots of up to sapling stage are great attractions for various wild animals like Gour, Wild boar, Monkey Sambar, and Elephant. Whereas Gour and Sambar browse only on shoot, Elephants, Wild boar even love roots. Enough Input and Effort need to be devoted for protection from this for first three years of plantation. Energised fences are relatively cheaper and effective option if regularly maintained on a day-to-day basis.

III. Stabilization of river banks - Treatment for riverine areas

Action plan for widening of torrents has been incorporated in JICA aided 'West Bengal Forest Biodiversity Climate Change Response'. The same may be replicated elsewhere outside the project areas if funds are received from other sources. While implementing this, following may be considered-

- Planned soil conservation structures along with vegetative measures are recommended for such conditions.
- Traditionally, these areas were planted with Khair-Sissoo along with other species depending on the successional stages of the area.

- It is proposed to revive those techniques and find alternate species in case of Sissoo mortality.

IV. Biodiversity conservation and Habitat improvement for wildlife

In view of severe Human Wildlife Conflict in the region, this is planned to improve habitat for elephants and other herbivores inside forests in the region. Food, shelter and water are the major habitat components and through habitat improvement plantations, food and shelter needs will be taken care.

Re-creation of natural indigenous forest may be tried on long term basis.

A model for habitat improvement plantation may be developed with fruit trees, fodder trees, in combination with bamboos and grasses depending on the site quality.

Habitat improvement program will also serve the purpose of improving biodiversity status.

Species

Local indigenous species which may serve as elephant fodder suitable for the particular site and gradient shall be chosen.

Nursery

One and half years old home-grown seedlings in polypots shall be raised before plantations. The slow growing species shall be maintained in the Nursery for two and half years before sending it for plantations. Every division will have separate areas for normal one and half year-old seedlings and for two and half year-old seedlings.

Creation

- a) Land to be prepared along with SMC works and adequate soil ameliorants to be used as per the soil nutrient status.
- b) Spacing: 3 x 3 meters, since purpose is to have short branchy trees to serve as fodder trees and wide spacing will support branching from lower levels will also be facilitated by browsing by elephants.
- c) 3 Cleaning and 2 mulching to be done along with application of fertilizer as per recommendation of soil test reports.
- d) Proper preparation of soil followed by planting of fodder grasses and seed sowing of fodder grasses can be taken up in augmentation in wildlife areas to provide adequate fodder to the wild animals.
- e) Barbed wire fencing may be provided in areas having high biotic pressure.

Protection from Wild animals

Enough Input and Effort need to be devoted for protection from this for first three years of plantation. Energized fences are relatively cheaper and effective option if regularly maintained on a day-to-day basis.

Maintenance

The plantation shall be maintained for three years and infilling to be done for the casualties.

V. Economic plantation for consolidation of Joint Forest Management.

Area allotted to Miscellaneous Working Circle may be considered for raising such plantation either followed by CFC or rehabilitation of degraded area. Clear felling followed by artificial regeneration is the working plan prescription and Teak was proposed as major species along with other miscellaneous timber species for this Circle

Species

50% Teak and 50% other local timber species suitable for the particular site shall be chosen.

Nursery

Miscellaneous species to be raised in large polypot/hycopot for one and half year. All seeds to be collected from selected seed sources as identified by the Research Wing.

The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next Financial Year from April to March and then will be taken up to plantation sites for plantations. The slow growing species shall be maintained in the Nursery for two and half years before sending it for plantations.

Every division will have separate areas for normal one and half year old seedlings and for two and half year old seedlings.

It is proposed to have selected clonal seedling for Teak and Gamar having fast growing feature and suitable for this area. Research Wing has already introduced some Teak clones from Kerala and Gamar clone from Assam. The propagules from these sources may be used to raise these economic plantations.

Creation

- a) Land to be prepared along with SMC works and adequate soil ameliorants to be used as per the soil nutrient status of the selected site.
- b) Spacing: - 2 x 2 meters, to obtain clear bole and to arrest weed growth.
- c) 3 Cleaning and 2 mulching should be done along with application of fertilizer.
- d) Barbed wire fencing/energised fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for three years and infilling to be done for all casualties with proper seedlings.

Social Forestry and Farm Forestry plantations

The forest area in the districts covering the zone is below the national average and the districts having higher forest cover are suffering from problems of over grazing, illegal felling, wildlife damage. To increase the green cover, carbon fixation and also to meet the local demand of tree product, the following measures are recommended for tree planting outside forest area –

The following types of plantations outside forest areas is proposed.

- i. Planting along the National Highways and State Highways.
- ii. Planting along road side
- iii. Tree Cultivation in Private Lands
- iv. Agro Forestry
- v. Canal Bank Planting
- vi. Urban Planting

Species

High value local tree species shall be promoted amongst the villagers to take up plantation activities in government lands and their private lands.

Emphasis on raising Teak, Gamar, Simul, Jarul and Agarwood plantation outside forest areas, both in public lands as well as private lands.

Nursery

One and half years old homegrown seedlings in hycopots or polypots shall be raised before plantations. Slow

growing species shall be maintained in the Nursery for two and half years before sending it for plantations. Every division will have separate areas for normal one and half year-old seedlings and for two and half year-old seedlings. The seedlings shall be supplied to the villagers willing to take up plantations in their lands at production costs.

Creation

Spacing- 3x3 meters, since tall seedlings will be available for plantations.
Cleaning and mulching techniques shall be taught to villagers.
Barbed wire fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years.

Distribution Nurseries / *Sabujshree* Effort should be made to distribute seedlings of tree species which are commercially viable, industrially aligned, quick growing and liked by local population.

3. Vindhyan Alluvial Zone

This zone is confined to two districts namely Dakshin Dinajpur and Malda. The recorded forest cover is very less – almost nil in the districts of this zone. The land use is mostly agricultural with human settlements. In order to achieve green cover in the districts of zone there is a need for taking up plantation activities outside recorded forest areas. The emphasis therefore would be on Social Forestry and Farm Forestry plantations.

Low lying and water-logged areas and problem of river bank erosion are issues in some parts of this zone.

Proposed Strategy in this Zone

- I. **Social Forestry and Farm Forestry plantations** - The forest area in the districts covering the zone is below the national average and, therefore, following measures are recommended –
 - i. Planting along the National Highways and State Highways.
 - ii. Planting along road side.
 - iii. Tree Cultivation in Private Lands.
 - iv. Agro Forestry
 - v. Canal Bank Planting
 - vi. Urban Planting

Species

High value tree species like Aghuru, Teak, Red Sanders and other valuable species and a mixture of local endemic species shall be promoted amongst the villagers to take up plantation activities in government lands and private lands.

Emphasis on raising Teak, Mahogany, Mango, Jackfruit and quick growing species plantation outside forest areas, both in public lands as well as private lands. Recently a species called Lamboo (probably *Khaya* sp) become very popular in this area. Though, it is an exotic, it may be encouraged in rural areas. It is fast growing, can be harvested 6-8 years and good for plywood.

Hijal and Arjun may be used in low lying areas and stabilization of river banks along with shrubs and grasses.

Nursery

One and half years old homegrown seedlings in hycopots or polypots shall be raised before plantations. The

seedlings shall be supplied to the villagers willing to take up plantations in their lands at production costs.

Creation

Spacing 3x3 meters, since tall seedlings will be available for plantations.

Cleaning and mulching techniques shall be taught to villagers.

Barbed wire fencing and bamboo gabions may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years.

- II. **Distribution Nurseries / *Sabujshree*** Effort should be made to distribute seedlings of tree species which are commercially viable, industrially aligned, quick growing, local and liked by local population.

4. Gangetic Alluvial Zone

This zone encompasses Murshidabad, Nadia, Purba Bardhaman, Paschim Bardhaman, Howrah, Hooghly and part of North 24 Parganas, Purba Medinipur and South 24 Parganas. The Soil is very fertile and deep alluvial silt. The land use is mostly agricultural with human settlement. In order to achieve green cover in the districts of this zone, there is a need for taking up plantation activities outside recorded forest areas.

Proposed Strategy in this Zone

- I. **Social Forestry and Farm Forestry plantations:** - The forest area in the districts covering the zone is below the national average and, therefore, following measures are recommended –
- i. Planting along the National Highways and State Highways.
 - ii. Planting along road side.
 - iii. Tree Cultivation in Private Lands.
 - iv. Agro Forestry
 - v. Canal Bank Planting
 - vi. Urban Planting

Species

Valuable local species shall be promoted amongst the villagers to take up plantation activities in government lands and their private lands, which has got potential for quick economic returns.

Emphasis on raising Teak, Mahogany, Mango, Jackfruit and quick growing species plantation outside forest areas, both in public lands as well as private lands. Recently a species called Lamboo (probably *Khaya* sp) become very popular in this area. Though it is an exotic, it may be encouraged in rural areas. It is fast growing, can be harvested 6-8 years and best for plywood. For Agro-forestry, cultivation of medicinal plants may be encouraged for better return.

Nursery

One and half years old homegrown seedlings in hycopots or polypots shall be raised before plantations. The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next Financial Year from April to March and then will be taken up to plantation sites for plantations. The seedlings shall be supplied to the villagers willing to take up plantations in their lands at production costs.

Creation

Spacing:- 3x3 meters, since tall seedlings will be available for plantations.

Cleaning and mulching techniques shall be taught to villagers.

Barbed wire fencing and bamboo gabions may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years.

- II. **Distribution Nurseries / *Sabujshree*** Effort should be made to distribute seedlings of tree species which are commercially viable, industrially aligned, quick growing, local and liked by local population. Improved varieties of different fruit species may be encouraged.

5. Undulating Red and Laterite Zone

The zone is spread across Birbhum, Purulia, Bankura and Jhargram and Paschim Medinipur Districts. The landscape is fragmented into intermittent forest areas and agricultural spreads. The forest soil is not very fertile and mostly lateritic in nature. The track is disturbed by Human Elephant Conflict and it gradually deteriorating due to poor/lack of elephant habitat inside the forest. The whole area is covered with either Sal coppice or plantation of Eucalyptus or Akashmoni. Management interventions are required to improve the situation.

Proposed Interventions

- a) The undulating & hilly tract are to be managed on watershed basis. Catchment Area Treatment Plan is to be prepared combining soil-moisture conservation measures and tree planting. In elephant zone, emphasis on revival of lost streams and springs in forest areas is to be developed and a model of such plantation in certain pockets like Tapoban, Lalgah, Barjora etc. Plantation of Fruit and Fodder trees along with grasses and shrubs as intercrop are to be done with an aim to create wildlife (elephant) habitat there.
- b) Plantation of Miscellaneous Species in and around the CAT Plan areas to enrich the growing stock is recommended. The area may be taken up for new plantation or may be enriched with gap planting.

Species

Local species which may serve as elephant fodder and suitable for the particular site and gradient shall be chosen. No outside species that are not native to the region shall be selected for plantation purpose.

Nursery

One and half years old home-grown seedlings in hycopots or polypots shall be raised before plantations.

The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next Financial Year from April to March and then will be taken up to plantation sites for plantations.

Slow growing species shall be maintained in the Nursery for two and half years before sending it for plantations.

Every division will have separate areas for normal one and half year old seedlings and for two and half year old seedlings.

Seeds to be collected from selected seed sources.

Creation

Spacing- 2 x 2 meters or 3 x 3 meters, since tall seedlings will be available for plantations.

3 Cleaning and 2 mulching as per the prescriptions of Working plans.
Barbed wire fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years and all casualties to be replanted with proper seedling.

c) Plantation of Sal and associates in and around CAT Plan areas

Species

50 % Sal and 50 % other local fruit bearing and fodder species which may serve as elephant fodder suitable for the particular site and gradient shall be chosen. No species that are not native to the region shall be selected for plantation purpose.

Nursery

One and half years old homegrown seedlings in hycopots or polypots shall be raised before plantations. The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next Financial Year from April to March and then will be taken up to plantation sites for plantations. The slow growing species shall be maintained in the Nursery for two and half years before sending it for plantations. Every division will have separate areas for normal one and half year old seedlings and for two and half year old seedlings.

Creation

Spacing 2 x 2 meters or 3 x 3 meters, since tall seedlings will be available for plantations.

Cleaning and mulching as per the prescriptions of Working plans.

Barbed wire fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years and all casualties to be replanted with proper seedling.

d) RDF in Scrub infested sites

Sites which have a canopy density between 10% – 25%, deficient in regeneration, weed infested and are under higher degree of degradation with large open gaps are selected under this model. The presence of appreciable root stock of native species which can be nursed / nurtured to better health and supplemental planting with high value native species is main objective of this model.

Identified area is surveyed and demarcated and the area is closed with CPT or barbed wire fencing, whichever is suited.

SMC works are taken up across the slope. SMC trenches of 5 x 1 x 1 meters across rills with spill ways and nala bunds to be created.

Taller seedlings maintained in nurseries for two and half years to be planted in weed infested areas so that the seedling are established immediately and do not have to face competition and stunting due to weed infestation.

Intercropping with medicinal plants, aromatic grasses may be done for quick rehabilitation of the site. It will add to the intermediate income for sustaining joint management.

Species

Local species suitable for the particular gradient shall be chosen. No outside species that are not endemic to the

region shall be selected for plantation purpose.

Nursery

Two and half years old home-grown seedlings in hycopots or polypots shall be raised before plantations. The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next two Financial Years twice from April to March will be taken up to plantation sites for plantations. The slow growing species shall be maintained in the Nursery for three and half years before sending it for plantations. Every division will have separate areas for normal two and half year-old seedlings and for three and half year-old seedlings for such areas.

Creation

Spacing 3x3 meters, since tall seedlings will be available for plantations.

Cleaning and mulching as per the prescriptions of Working Plans.

Barbed wire fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years as per the estimates drawn up from Schedule of Rates (SoR) for forestry works.

e) Plantation of Sandalwood, Red Sanders and other economic species as replacement to Akashmoni and Eucalyptus

- One of the main reasons behind the straying of elephants outside forests is presence of large tracts of Akashmoni and *Eucalyptus* plantations in South West Bengal.
- The main reasons behind introduction of Akashmoni and *Eucalyptus* was to gradually cover the degraded forest sites denuded before the introduction of JFMC's. The JFMC's were promised usufruct share in lieu of their protection support.
- However, over the years the situation has changed and because of non- availability of adequate fodder sources in these monocultures, the elephants are straying outside the forests.
- To keep a balance of meeting the needs of JFMC's in form of usufruct share Sandalwood, Red Sanders and other economic species plantations with rotation age of 25 years shall be targeted over next few decades.
- Teak is another species may be used to raise economic plantations by using clonal propagules, which are fast growing and can be harvested with a rotation age of 20-25 years. It has got a steady demand and market and may be helpful to sustain the practice of joint management.
- To increase productivity, intercropping with aromatic grasses and medicinal plants may be adopted.

Species

50% Sandalwood/Red Sanders/OES and 50% other local fruit bearing and fodder species which may serve as elephant fodder suitable for the particular site shall be chosen. For Sandalwood plantation, specific associate to be selected for better growth of the species.

Nursery

One and half years old home-grown seedlings in hycopots or polypots shall be raised before plantations. The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next Financial Year from April to March and then will be taken up to

plantation sites for plantations. The slow growing species shall be maintained in the Nursery for two and half years before sending it for plantations. Every division will have separate areas for normal one and half year old seedlings and for two and half year old seedlings.

Creation

Spacing 3 x 3 meters, since tall seedlings will be available for plantations.

Cleaning and mulching as per the prescriptions of Working Plans.

Barbed wire fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years as per the estimates drawn up from Schedule of Rates (SoR) for forestry works.

f) Quick Growing Species Plantation

The purpose of this plantation model is to meet local requirement of fuelwood, small timber in vicinity of villages. Target areas will be forest fringes with very high biotic pressures. This will be worked on a short rotation of 7-10 years.

Choice of Species

- Local indigenous species to be chosen as per the model/purpose. No exotic species will be planted unless specifically mentioned.
- High priced timber species may be used as per locality factor.
- Teak, *Acacia*, *Melia dubia* may be considered for this purpose.

Nursery

Seedlings will be raised for local indigenous quick growing species and seeds will be collected from selected seed source. Clonal material to be raised for fast growing indigenous or selected species.

Creation

Spacing- 2 x 2 meters, since purpose is to encourage competition among fast growing species to get maximum biomass production during short period.

3 Cleaning and 2 mulching with application of fertilizer. Vegetative fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years and infilling of all casualties to be done with proper seedling.

g) Tree Outside Forest

- If Nationally Determined Contributions of sequestering 2.5 to 3.0 billion Tonnes of Carbon by 2030 has to be met, trees are to be raised on a massive scale outside forest.
- The species are to be fast growing and Industry aligned so as to ensure ready market. Whereas, *Acacia auriculiformis* has been planted extensively under Tree Plantation outside Forest Areas, there has to be local indigenous replacements. Ghoraneem (*Melia dubea*) is one of the most favoured species by plywood industry at present as it gives best quality veneer and has great growth rate potential as tested at various

locations including West Bengal. It can be operated on rotation of 7 (seven) years and can fetch high returns and there are high chances of great acceptability by the citizens due to high profitability. *Bombax cieba* and *Anthocephalus cadamba* is a quick growing species and in demand by local plywood industries. *Gmelina arborea*, *Holoptelia integrifolia*, *Albizia lebbeck*, *Artocarpus heterophyllus* and *Dalbergia sissoo* are local timber species in local demand by Saw Mill Industries. *Terminalia arjuna* comes up exceptionally well in Purulia and should be essential species for the District. In order to enhance green cover, plantation of economically viable species like Sandalwood, Red Sanders, Teak etc. should be promoted in the non-forest areas.

6. Coastal Saline Zone

This zone is confined to Purba Medinipur and South 24 Parganas districts. The respective forest cover is 0.035 % and 41.54 %. The soil is saline and not very fertile.

Plantation guidelines

a. Mangrove Plantations

Mangroves are unique, salt-tolerant inter-tidal forest at the edge of land and sea. Mangrove nursery and plantation should include selection of proper seed, collection of propagules, raising of nursery seedlings. The raising of mangrove seedlings should be done from July to December with adequate treatment of seeds, especially for species like *Sundari*, *Pasur* and *Dhundul*. Special treatment of *Golpata* is also proposed. The seedlings should be maintained in the nurseries for one-and-a-half year before it is planted in the site. The mangrove plantation time extends from July to December. Efforts should also be made to ensure high quality propagules for certain species dibbled directly in the plantation site. Before dibbling of the propagules, necessary measures for ensuring quality propagules like storage, gradation and transportation should be carefully considered. The dibbling of propagules is prepared in spacing of 1 x 1 meter that is 10,000 propagules per hectare.

No exotics should be planted and species like *Bain*, *Keora*, *Dhundul*, *Sundari*, *Garan* etc. which are indigenous in nature should be promoted and planted in appropriate areas.

b. Coastal Shelterbelt Plantations

Species

50% Jhow and 50% other local species shall be chosen. No outside species that are not endemic to the region shall be selected for plantation purpose.

Nursery

One and half years old homegrown seedlings in hycopots or polypots shall be raised before plantations. The principle would be to start the nursery preparations from November to be maintained up to March. The same seedlings would then be maintained during next Financial Year from April to March and then will be taken up to plantation sites for plantations. The slow growing species shall be maintained in the Nursery for two and half years before sending it for plantations. Every division will have separate areas for normal one and half year old seedlings and for two and half year old seedlings.

Creation

Spacing 3x3 meters, since tall seedlings will be available for plantations.

Cleaning and mulching as per the prescriptions of Working Plans.

Barbed wire fencing may be taken up in areas having high biotic pressure.

Maintenance

The plantation shall be maintained for two years as per the estimates drawn up from SoR for forestry works.

CONCLUSION

The Guideline has been put in place to enhance the quality and survivality of plantation. The motto would be to plant quality, tall and site-specific seedlings to ensure better outcome, ensure biodiversity and fodder for the wildlife while addressing the aspirations of the JFMC.

Promotion of economically viable species outside forest is also proposed to ensure increase in green cover and provide viable economic alternative to rural Bengal. Fencing is also proposed to secure better survival of plantation. The broad prescription in this guideline entails:

1. Plantations should be undertaken as per the Agro-Climatic Zones and the prevailing issues in these areas. There shall be a concerted effort for introduction of species having higher economic returns in Social Forestry Plantations and JFMC areas.
2. Plantations will be raised by using tall seedling (1.5-3 year old) in polypot or hycopot, seeds to be collected from selected seed sources and clonal seedling is to be used for raising economic plantations.
3. Plantations in wildlife areas will be protected by energised fencing or other protective measures.
4. Replacement of Akashmoni and *Eucalyptus* with indigenous species in elephant zones for keeping the needs of both the elephants and JFMC's. While replacing these, some economic species like Sandalwood, Red Sanders, Rosewood may be introduced in phases.
5. Raising of rotation age in elephant (Wildlife) rich areas supplemented with water conservation structures.
6. Promotion of Social Forestry through commercially viable species.

**GUIDELINES ON PREVENTING
AND DEALING WITH HUMAN
WILDLIFE CONFLICT (HWC),
WEST BENGAL
FOREST DEPARTMENT**

Background

As per the Constitution of India, it is the duty of every citizen to protect and improve the natural environment including Forest and wildlife and to have compassion for living creatures. The State Government is fully committed to protection of wildlife and reducing the Human Wildlife Conflict. Yet, incidences of negative interaction have been reported from time to time where wild animals including large mammals such as elephant, tiger, leopard, bear etc. that are protected under the schedules of Wild Life (Protection) Act 1972, are involved. Human Wildlife Conflict many a time results in death/injury/permanent incapacitation of human beings/domestic animals/livestock due to attack by wild animals or loss of crops and property.

Therefore, the need for this guideline.

Recognizing that the factors leading to Human Wildlife Conflict and associated death/injury to human lives and or crops/scheduled animals, and their remedial measures often concern several departments of the State Government, this guideline seeks expedited inter-departmental coordinated and effective action by State Government on preventing and dealing with Human Wildlife Conflict (HWC) and associated death/injury/permanent incapacitation of human beings/domestic animals/livestock due to attack by wild animals or loss of crops and property and also accidental deaths of wild animals listed in Schedule I to IV of Wild Life(Protection) Act 1972.

The following objectives are sought to be achieved:

- i Reduction /Mitigation of Human Wildlife Conflict.
- ii Improvement in wildlife habitat especially in areas commonly involved in HWC by leveraging resources from different departments of the government, so as to provide adequate food and water inside forests.
- iii Ensuring safe passage of wild animals along their scientifically-identified movement routes or corridors outside forests, including improvement of habitat conditions in and along those routes;
- iv Creation of locally suitable biological/Power barriers on and along the forest-fringe farms, including alteration of crop patterns, to deter wild animals from raiding private farms/villages;
- v Ensuring adequate and timely payment of ex-gratia to the persons affected by HWC; and
- vi Creating an intelligent and effective system based on local intelligence and people's participation for preventing wildlife crimes, including killings of wild animals outside forests and trade/consumption of animals parts, and prosecution of offenders.

In order to prevent and manage Human Wildlife Conflict, and mitigate the risks and adverse impacts associated with it, including killing of wild animals, the following is proposed to be adopted:

MANAGEMENT MEASURES

1. Inter-departmental Coordination Committees

Prevention and management of HWC and associated death/killing of wild animals concerns several government departments, and, therefore, close coordination is required for timely and adequate action. Coordination committees are proposed at the State and district levels to be constituted.

Co-ordination committee at the State level (SLCC)

- i. It is proposed to constitute a State Co-ordination Committee (SLCC) headed by the Principal Secretary of Forest, with members including PCCF-HOFF, PCCF General with Representatives of the following Departments- Finance, Home, Police, Panchayat, Agriculture, Power, Department of PWD (Road and Highways), Representatives of Tea Gardens, SDRF, Representative of Defence, IG/SP Forest of Police, State

Nodal Officer on HWC.

The Chief Wild Life Warden will act as the member Secretary of this committee.

- ii. The committee would meet as many times as necessary, but no later than six months of the previous meeting.
- iii. Functions of the SLCC:
 - o To further the objectives of this guideline, review the required infrastructure, manpower and monitoring systems in the State, and take necessary measures to strengthen the same;
 - o Monitor the number of HWC cases and their geographical spread, and provide guidance/instructions to different departments for action to be taken by each one them in order to minimize/prevent HWC in those areas;
 - o Review the quantum of ex-gratia relief, issue guidance/instructions for expedited payments, and work towards providing adequate funds for the same;
 - o Review the cases of revenge killings of wild animals and other wildlife related crime, and issue necessary guidance/instructions to the concerned departments/agencies as appropriate; and Recommend to State Wildlife Board and/or the Government, police and programmatic measures, including for capacity building, required for fulfilling the objectives of this guidelines.

District Co-ordination Committee (DLCC)

- i. It is proposed to constitute an inter-departmental coordination Committee in all or identified district(s) of the State that are vulnerable to HWC to be chaired by District Collector, and comprising of district-level officers of departments/ organizations, including Bon O Bhumi Sanstha Sthayee Samity in the SLCC. The senior most wildlife Warden of the District will act as Member Secretary.
- ii. The Committee should also include Honorary Wild Life Warden residing in the district and up to two non-official expert members on the recommendation of the Member secretary.

2. Establishment of Rapid Response Teams (RRT)

- i. Rapid Response Teams (RRT)/AIRAWATS for quick action and management of conflict situations, especially in the hotspot areas. The RRTs should include trained staff with technical knowledge, be well equipped with materials as per local needs. The DLCC should facilitate the involvement and contribution of related departments in the district for establishment of RRTs. Training of RRT personnel should be organized periodically in all matters related to HWC by experts. The Chief Wild Life Warden will make assessment of RRTs at regular intervals, including men and materials to be made available to RRTs, and take necessary steps for their timely procurement with the help of DLCC.
- ii. Depending upon the severity of HWC, States may establish dedicated circle wise Control Rooms with public helpline/Toll free hotline numbers which could operate on a 24X7 basis.

3. Provision of financial resources for HWC

It is to underline that HWC, if not attended properly, may acquire serious proportions, endangering both human life/property and the wildlife. Therefore, it shall be the endeavor to provide adequate budgetary resources for dealing with HWC, and in particular for Early Warning Systems (EWS), RRT, ex-gratia payment and awareness generation. Measures like use of Revolving Fund/SFDA/TCFT FUND to help in timely availability of financial resources for dealing with HWC and expedited payment of ex-gratia should be put in place.

4. People's participation in managing HWC

Local people should be involved in dealing with HWC particularly in the hotspot areas, by formation of teams at

village or a group of village level comprising of members of Joint Forest Management Committee (JFMC), etc. to ensure timely communication, coordination and immediate management of HWC. Basic equipment, communication tools and training should be provided to these teams. We may also consider providing 'contingency funds' to JFMCs for dealing with contingent expenses in cases of emergency. This can be apportioned from the share money given to the JFMC members.

5. Dealing with Law-and-order situation in HWC cases

It is often seen that in HWC situations, dealing with a large number of people who quickly gather at one place to view wild animals or to prevent them from entering their farms/ habitation, becomes a challenging task that hampers safe passage of wild animals or rescue work. Administrative mechanisms to ensure efficient coordination and cooperation of the law enforcing agencies at such situations to ensure smooth handling of such situations needs to be prepared. There is provision of proclamation of 144 CRPC as per order issued by the Home Deptt. GOWB, this should be effectively utilized.

6. Adoption of Early Warning Systems (EWS)

To develop and establish Early Warning Systems (EWS) to manage HWC. Different technologies like Seismic waves/IOS Mobile Technology, infrared technology, temperature and movement sensors, in alerting the movement of large herbivores like elephants in and around most vulnerable villages; local JFMCs may also be involved in transmitting information on presence of Elephants.

Drones and other systems for tracking movement of wildlife herd in and around Hot-Spot areas such as radio/satellite collars.

Warning alerts of presence of Wild animals to local leaders / officials/villagers through SMS or FM Radio/community radio/local TV or by using public address system.

7. Adoption of traditional/common management practices

Barriers -

Barriers that prevent easy movement of wildlife from forest area to human habitations may be considered in certain cases after thorough evaluation about their necessity and effectiveness. These could in the form of:

- Trenches (especially for Elephants)
- Solar-powered electric fences
- Rubble walls
- Other types of fences made from steel channels, rail, wire guide ropes, bars, bee-hive and vegetative fencing.
- Nylon net fencing in areas of Sundarbans.

Alternate/ appropriate Agri-horticulture/ agroforestry around wildlife rich areas

It is well known that wild animals get attracted to palatable and nutritious crops grown on crop fields around forest areas. This leads to damage of crops and financial loss and hardship to the farmers who are often poor people from the tribal communities. The concerned departments should promote crops in these fringe areas which are unpalatable to wild animals. Farming or agroforestry models may include cash crops like chilies, lemon grass, khus grass etc. suitably mixed with appropriate tree/ shrub species. A comprehensive long-term plan for alternate cropping should be prepared and implemented by the State Agriculture/ Horticulture department under different schemes in such vulnerable areas.

Augmenting fodder and drinking water in forest areas

Improving wildlife habitat by management of invasive species, augmenting fodder species and Provisioning water

for wild animals in lean periods is the key to minimizing HWC, and, therefore, this should be undertaken extensively. Desilting of existing water holes should also be taken on priority basis. All wildlife rich areas and wildlife corridors in and around the Hotspots should be treated on priority. The SLCC and DLCC should review the progress and facilitate mobilization of necessary resources available in different departments/ organizations for this purpose.

It is important that the biodiversity inside the forest is enriched through promotion of palatable/fodder species. Though most of the forest patches requires enrichment, areas like Barjora, Lalgah / Ramgarh, Chandabila / Tapovan and Mayurjharna deserves special attention for augmentation of fodder and water inside the forest. As these areas have the potential of retaining Elephants for a considerable period of time.

The rotation age of felling in Elephant/wild animal sensitive areas should be increased to atleast 20 years.

Augmentation of Prey base in Carnivore rich areas is also proposed by following strict veterinary protocol

Improvement of local livestock

Free ranging livestock becomes more vulnerable to killing by wild animals. The Animal Husbandry department should formulate and implement special plans for improved stall-fed farm animal stock and practices, especially in the Hotspot areas. This will also reduce grazing pressure on native wildlife habitats and improve local economy.

8. Dealing with problem animals

- i. Providing safe passage to the wild animals involved in HWC in human habitations should be the topmost priority, and local administration should ensure better crowd management. If everything else fails, capture and translocation using scientific methods may be resorted with the approval of Chief Wild Life Warden .It is necessary that scientifically prepared dossier of animals is required to be made for identification of the problem animal. The process eventuating into capture, should not be delayed under any circumstances . The problem animals should be captured and can be released in a safer location in the same or different landscape after it is radio collared or kept in captivity in suitable natural fenced enclosures or it can be also used for other suitable purposes(Kunki for Elephant, etc, if the age and nature of the animal permits).
The CWLW may issue a SOP for the benefit of the field official in dealing with such situation.
- ii. In the future aggressive intervention of capturing few Elephants from the herd may also be resorted to stop repeated raiding.

9. Population management of wild animals

The population of wild animals like Elephant, Rhesus macaque, Wild pig have increased manifolds. The increase of these animals has contributed to the increase in Human-Wildlife Conflict in many places. There is a need in the future for managing the population. The State Government may contemplate undertaking Population management steps through Immune-contraception Method in order to arrest the increase of these animals, decelerating the number of Human-Wildlife Conflict in the future.

FINANCIAL MEASURES

10. Ex-gratia relief

- i. SLCC should review the rate of ex-gratia relief at regular intervals with a view to ensure that it is effective both in providing necessary support to the victim and to prevent revengeful action by vulnerable/ affected population. The rates of adjoining States and that of Central Government under various Centrally Sponsored

Schemes, whichever is higher, should guide the review.

- ii. A suitable portion of ex-gratia relief should be paid within 24 hours to the affected persons in the case of death and injury to persons
- iii. SLCC and DLCC should regularly review that ex-gratia, including immediate relief within 24 hours, is being paid in a timely manner, and for this purpose necessary reports/ documents are being made available by police, revenue and medical authorities to the local Range Officer of Forests expeditiously on priority. State Governments may establish a robust procedure with specific timelines for this purpose. Revolving Fund may be established with local Divisional Forest officer for quick payment of ex-gratia and other expenses in dealing with HWC.

11. Natural Disaster

The Government may consider to declare the Human-Wildlife Conflict as a 'Natural Disaster' under the NDRA Act. Some of the states like Uttar Pradesh, Assam have already done it. This helps the local villagers who bear the brunt of the Human-Wildlife Conflict, sometimes receiving compensation at much later date. The inclusion of Human-Wildlife Conflict as a 'Natural Disaster' will have a positive effect on the lifestyle of the communities affected by the Human-Wildlife Conflict.

12. Crop Insurance

Including wildlife as a cause for crop compensation: The Govt. of India has already issued advisory for including wildlife as one of the reasons for Pradhan Mantri Fasal Bima Yojana. Since, the State Government is also having its own, State Fasal Bima Yojana, it will be appropriate to include crop damage induced by wildlife also as a part of the State Fasal Bima Yojana. This will be helpful for the rural communities who faces hardship due to damage of crop due to Human-Wildlife Conflict.

**STANDARD OPERATING PROTOCOL TO PREVENT,
SUPPRESS AND MANAGE FOREST FIRES IN
WEST BENGAL**

Introduction

Forest fires are regular in subtropical regions of the country and cause considerable damage to forests both quantitatively and qualitatively. West Bengal is having recorded forest area of 11883.75sq km. The forest area constitutes 13.38 % geographical area. Varied type of forest is found in the state starting from Sub alpine forests to Mangroves. Considerable portion of East Himalayan Sal, Northern dry Mixed deciduous forests and dry peninsular Sal and teak forests are prone to high intensity forest fires. As per the assessment of FSI around 9-10 % of forest area of the state is highly prone to forest fires. The fire season usually starts from the Month of November and lasts till May end in the state. Several executive orders, working Plan prescriptions, management plans and Tiger Conservation plan prescriptions provide the basic guidelines to field units in managing forest fires. However, the Standard operating protocol will assist field level units with comprehensive directions in preparing, handling the forest fires and post forest fire management effectively.

This protocol is intended to be a means for providing oversight of the management of forest fire operations for the West Bengal forests. The protocol will identify specific activities that the field units are expected to provide and the standards which must be met in managing forest fires. This will also will define roles, responsibilities, and operational procedures for the Divisional units, Range units and firefighting teams.

Goals

1. To provide safe, cost-effective mobilization of resources to divisions witnessing frequent forest fire incidents.
2. To promote efficient forest fire fighting operations through inter-departmental cooperation and standardized protocols.
3. To emphasize safety of Staff, JFMC members, firefighting teams, public and firefighter safety in all aspects of operations.
4. To identify priority areas according to criteria, vulnerability, weather parameters and allocate resources accordingly.
5. To protect human life and wildlife life and minimize damage to biodiversity.
6. To recognize inter departmental coordination, specific roles and requirements on forest fire emergencies, special equipment requests and skills etc.
7. To provide timely communications on information and decisions that affect the ability of divisional units, Range units and field units in forest fire management.
8. Involvement of SDMA, NDMA and other agencies depending on the gravity of forest fires.

Pre fire season Activities -

- i. Field units like Divisions, Ranges and Beats should prepare the check list of firefighting equipment available and keep the equipment like fire blowers, rakes, shovels, fire extinguishers, water sprayers, fire resistant helmets, shoes and gloves in full readiness. Additional equipment required should be procured before the onset of fire season.
- ii. Extensive awareness programmes should be conducted to educate the society, people living in and around the forests, visitors, tourists etc. including the legal implication.
- iii. Workshops and trainings should be conducted for field staff, JFMC members and other department personal in firefighting, use of firefighting equipment and safety protocols etc.
- iv. Emergency communication details such as contact numbers of nearest Fire tender, Police station, Revenue administration and hospitals should be available with Beat, Range and other such firefighting field units.

- v. All the water tanks in Ranges, Beats, timber depots should be inspected and kept in readiness. Water refilling points for fire tenders should be identified and see to it that the communications to such places is available.
- vi. A preordination meeting with departments involved in forest fire prevention and management should be conducted, before the fire season.
- vii. Special awareness campaigns should be taken up against targeted groups such as cattle graziers, NTFP collectors, tourists, visitors and forest fringe people.
- viii. All the communication channels such as wireless network, Mobile phone etc should be checked and kept in readiness.
- ix. First aid Kit should be maintained in the Ranges and Beats.
- x. Annual Plan of operations for forest fire schemes shall be prepared well in advance by the Divisions. The activities proposed should reflect the efficacy of reducing the fire and enhance the ability of field units in tackling the forest fire effectively. APO should be based on the fire vulnerability index and fire prone mapping and as per actual field requirements. Funds from others schemes such as CAMPA, State Plan should also be sought in addition of CSS IFM schemes. APO should be sent to MoEF&CC, by April of every year so as to ensure timely release of funds. APOs of other scheme also should be submitted well within the prescribed time.

Forest Fire Prevention -

Fire prevention is the first step towards effectively managing the forest fires. The following activities should be carried out by the field units before the fire season peaks.

Mapping of fire prone zones -

The entire forest should be mapped according to the vulnerability index to forest fires based on previous fire incidents, weather parameters and forest types. The fire vulnerability maps should demarcate the highly vulnerable forest ranges and beats and same should be communicated to field units before the start of the season. The resource allocation, preparation of APO should be based on the fire vulnerability. Highly vulnerable divisions should be allocated with more resources to deal with any impending contingency.

Control burning -

Controlled burning, also known as prescribed burning, involves setting planned fires to reduce the fuel load and also to create fire breaks. All the divisions should undertake control burning by collecting the dry mass of leaves, twigs dead grass, fallen tree branches etc to the centre and burn them to create fire breaks. This should be done all long the major roads, fire lines, compartment boundaries, village boundaries etc. This activity should start from November and should be completed by January of every year by all the field units. Fire blowers should be extensively used to blow the biomass to centre and burnt. The weather conditions should be taken into account to ensure fire doesn't to spread to other areas.

Reduction of forest floor biomass -

One of the major reasons for forest fires is the availability of abundant dry biomass in the form of dry leaves, fallen twigs, and grasses on the forest floor especially in deciduous forests. The fuel load has to be reduced through control burning, by encouraging JFMC members to collect the dry biomass for their use. Alternate Use of forest floor biomass shall be encouraged among JFMC members for compost making, vermicompost, manure etc. JFMCs be encouraged to collect dry fallen twigs as fire wood.

Fire lines -

All the fire lines in the divisions must be cleared and maintained before the onset of fire season. Control burning of

fire lines shall be undertaken wherever necessary. Fire lines in and around plantations should be created and the ones which are under maintenance should be completed well in time. Wherever new fire lines are required they should be proposed in CSS-IFM, CAMPA and State plan schemes and should be created and upgraded at periodic intervals.

Management of Weeds -

Weeds such as Eupatorium in South Bengal act as major fuel load and acts as fuel to forest fires. The fuel load in the form of weeds should be reduced by control burning, weed removal, weed eradication programmes.

Soil Moisture Conservation -

Extensive Soil moisture conservation works such as earthen dams, check dams, Rock check dams, contour trenches etc. should be proposed in high risk and high fire prone areas and constructed. This will not only provide water for firefighting teams but also will improve the moisture regime of the area.

Awareness Generation -

99 percent of forest fires are anthropogenic in nature. Some fires are intentionally lit by cattle graziers for promoting growth of fresh grass for their cattle and NTFP collectors to ensure ease of NTFP collection like Mahua seeds etc. Extensive awareness programmes and workshops should be conducted by targeting the groups responsible for forest fires. Society and villagers should be educated about the ill effects of forest fire and negative impact on their health. If any person is found to kindling forest fire, such persons should be apprehended and legal action as per the IFA 1927 and WLPA 1972 (as amended) shall be taken.

Formation of District level Committee for Forest Fire Management -

A district level committee shall be formed to guide and oversee the forest fire management. The committee shall be headed by Chief Conservator of Forests or Conservator of Forest whosoever is in charge of the circle.

The committee may consist of:

- 1) All the Divisional Forest Officers in the district,
- 2) Representative of District Magistrate not below the Rank of (ADM/SDO)
- 3) Representatives of District Police (Not below the rank of ADSP or SDPO)
- 4) Ban o Bhumi Sthayee Samiti Karmadhyakka,
- 5) Honorary Wildlife wardens of the district
- 6) Representative of NGOs operating in the district as recommended by the DFOs
- 7) Representatives of Fire Department
- 8) Representative of Health Department (CMOH/Asst CMOH)
- 9) Representative of District Disaster Management authority.

Functions of the committee -

- To ensure the adequate preparedness of the agencies involved in Forest fire management.
- To ensure and establish coordination among inter departments for effective participation in mitigating the forest fires wherever and whenever called upon to do so.
- Conduct mass awareness programmes for targeted groups to reduce the forest fire incidents
- To coordinate with state level authorities and National level authorities whenever the assessment on the ground suggests their requirement.
- To seek assistance of SDMA, NDMA and armed forces whenever the situation demands.

FIRE DETECTION -

Fire Watch towers:

All the existing watch towers in the division shall be maintained, utilised and provided with forest fire watchers during the fire season to ensure early detection of fires. Wherever new watch towers are required same should be proposed in the APOs.

Early warning -

Forest Survey of India, with years of experience with the repository of fire related data, developed an indigenous "Early Warning Alert System for Forest Fire". The alerts to State Forest departments are based on parameters like Forest Cover, Forest Type, Climatic Variables (Temperature and Rainfall) and recent fire incidences over the area. The GIS layers of these parameters are overlaid and intersect areas above threshold values are chosen and communicated as pre warning forest fire alerts in the form of KML files through email to the nodal officer of the State Forest Departments. These warning are communicated to divisions through email and divisions upon receipt of prewarning shall take necessary preventive steps in the locations specified.

Forest Fire Alerts -

Forest fire portal of Forest Survey of India provides SMS alerts based on satellite data (MODIS and SNPP VIRS) on near real time detection of active forest fires. Divisions shall register as many numbers of staff as possible in the FSI fire portal to receive SMS alerts on the registered mobile numbers. Efforts should also be made to include as many numbers of JFMC members, Panchayat Raj institution authorities, Revenue, Police and District administration authorities responsible for disasters etc. shall be registered on the portal to receive forest fire alerts.

Ground based detection -

Divisions should intensify the patrolling in fire prone area during the peak fire season (Jan to May). They should also engage fire watchers and place them strategically. JFMC members should be asked to assist Ranges and Beats in early detection of any fire incidents.

Fire Suppression and Management -

Once the forest fire has been reported either by fire watchers, JFMC members or through FSI fire alert system, print and electronic media or any other sources, the following protocol shall be followed.

- Fire control teams along with equipment from nearest Beats, or Ranges should be immediately dispatched to the location of fire.
- If additional man power is required same should be sourced from nearest JFMCs.
- Efforts should be made to prevent the spread of fire to other areas and contain it to as small area as possible.
- If the fire is in the vicinity of village and there are chances of its spread to human habitations and property, then District administration, Police administration and Fire departments should be informed immediately.
- Once the fire is controlled it should be communicated to Divisional Forest officer.
- If the fire cannot be controlled and contained, additional manpower from neighbouring Beats, Ranges and if necessary, from neighbouring divisions should be sought and same should be arranged by neighbouring Beats, Ranges and Divisions.
- Quick assessment of requirement of fire tender in controlling the fires is to be done and same should be communicated to Fire Department authorities in the district.
- District level committee should monitor all the large forest fires and forest fires which are active beyond 24 hrs. It should assess the situation and demand the help of District Disaster Management Authorities and State

Disaster Management Authority depending on the gravity of the situation. If the fire continues, help from the Disaster management cell of the MOEFCC can be sought.

Post Fire Management

Online feedback -

Forest fire portal of Forest Survey of India provides SMS alert to registered users on forest fire incidents. There is also a system of providing online feedback that can be provided along with SMS alert confirming the forest fire and action taken thereof and losses if any. All the forest fire alerts received through the portal shall be provided with feedback by field units. The similar feedback should be updated in monthly MIS module of the Forest Directorate.

Restoration of fire affected areas -

Divisional Forest officer should assess the damage caused by forest fires and submit a report to Circle in charge. If considerable damage to flora has taken place, the Division shall take up suitable actions to restore the area through appropriate schemes. If Plantation areas are damaged, the extent of damaged area has to be reafforested in the ensuing financial year. Soil moisture conservation works should be taken up in the affected areas to increase the moisture regime of the location. Replanting of the area with local species of plant/grasses (for small fauna) should be given priority.

Evaluation of Losses -

Range officer after every fire incident must inspect the fire affected area and assess the loss in-terms of flora, fauna and biodiversity. Range officers shall submit a report to Divisional Forest officer within a week. All the losses estimated by Range officer shall be reviewed by ADFO and final loss report authenticated by Divisional Forest officer shall be submitted to PCCF & HoFF Office.

Monitoring of Fire affected area -

During the fire season or once it is over, the fire affected areas shall be monitored for the impact of forest fire on Flora, fauna, biodiversity, soil and such other areas as deemed necessary by Research and Monitoring wing of Forest Directorate and should come up with suitable remedial measures. Such remedial measures should be communicated to territorial and wildlife divisions for necessary rehabilitation and restoration of fire affected areas.

REVIEW

The Fire Management SOP is to be reviewed every 3 years or earlier if:

- There is an identified risk to fire management strategy.
- A significant safety or unplanned fire occurs that caused immense damage.
- There are changes in policy or related legislation regarding Forest fire management.

**CSR GUIDELINE FOR
FOREST DIRECTORATE,
WEST BENGAL
FOREST DEPARTMENT**

Overview

West Bengal, which has a recorded forest land of 13.38% of its geographical area, during recent past has shown an increasing trend in the Forest Cover increase. As per the latest report “India State of the Forest Report 2021” published by Forest Survey of India, Ministry of Environment & Forest, the total Forest & Tree Cover of the State is 21.61% of the total geographical area of the State. Increase in Forest Cover and maintain the present Forest Cover in good health is imperative, therefore, to fulfill the objectives of National; Forest Policy, 1988 and to achieve the promise that the country has committed at COP-26. Multiple interventions like afforestation, protection of forest and wildlife, soil and moisture conservation, research etc are taken up to ensure the protection of the present forest and wildlife and also to enhance the level of the same in the future.

Forest Department have been receiving funding support from the corporates through their CSR/CER activities. Organisations like IOCL, Reliance, TCS have associated them for conservation of forest and wildlife. In order to streamline the procedure of receipt and use of external funding through CSR/CER of corporates and to bring in uniformity in mechanism it is imperative that a guideline be issued for receipt of funds for such cases.

The permissive guidelines for receiving CSR funds in Forest Directorate:-

The conservation of Natural resources is not only a moral duty also a constitutional obligation for all. There are many corporate houses based in the state and also in the country that are willing to participate in the conservation of nature and wildlife. The present guidelines will help in formalizing the process of receiving such funds for conservation and expansion of Forest resources and Wildlife. This consists of two parts a) The Operative guidelines and b) the procedural aspect. These guidelines are required to facilitate corporate to lend their support in protecting our precious forests and wildlife resources. This would give the right connect to the environment and a sense of ownership of the natural resources. We need to realize the importance of conserving these invaluable natural resources for the sake of our future generation. A broad operative guideline to take up CSR and CER activities in Directorate of Forests. Government of West Bengal is stated below.

a) The Operative Guidelines -

1. All proposed activities finalized by the CSR support, after observing the norms mentioned earlier shall be routed through the State CSR Cell. The CSR cell proposed to be concomitant with the Governing body of SFDA.
2. Every Territorial/ Social Forestry/Soil Conservation, Wildlife Divisional Forest Officers, Director of zoos and Deputy Director of Tiger Reserve will prepare a Charter of Desirables wherein the activities desired for CSR support are articulated along with the expected cost of the intervention.
3. The chosen activity by the Corporate shall be in the list of the Charter of Desirables.
4. The CSR contribution may be in form of physical assets contributed to the Forest Department or Monetary contributions.
5. Activities desired should not infringe upon existing acts or guidelines such as Forest conservation Act. Wildlife protection Act. Environment protection Act etc.
6. Activities desired should be compatible with the Working Plan and Management Plan of the division/Wildlife Sanctuary/National Park, Tiger Conservation Plan, Zoo Master Plans etc.
7. Activities desired as much as possible, shall be of nature where regular government programmes do not provide funding/support.
8. Activities desired can be one time or multi-year activity.
9. The interested Corporate shall be given the option to choose the intervention they desire to support.

10. State CSR Cell shall be the coordinating agency for facilitation and monitoring of the progress of agreed activities as well co-ordination between the participating Corporate and implementing unit of the Forest Directorate, Government of West Bengal.
11. State CSR Cell shall also be responsible for reporting of all other statutory compliances. These shall be a quantified amount in the contract being the cost of the shortlisted activity for administration, facilitation fee for compliance with monitoring and compliance of reporting with various agencies inclusive of Union and State Government.

b) The Procedural Guideline -

1. Once the interested Corporate agrees to fund the project, the concerned division shall prepare a DPR for the agreed desirables and send the same to the funding Corporate. After the funding Corporate gives its in-principle approval, the same may be sent to CSR Cell through his controlling officer. The rates contained in the DPR shall be in accordance with the SoR for forestry works and shall be vetted as per the Schedule of Rates for Forestry works and in case of civil works shall be in accordance with PWD SoR and has to be vetted by appropriate Engineering authorities. The DPR may have a provision of 3 % contingency for administrative expenses.
2. The CSR cells shall examine the proposal and after it is satisfied with the DPR, the same may be sent to Forest Department for approval.
3. After the approval of Forest Department, tripartite Agreement/ Memorandum of Understanding shall be signed by the implementing units of the Forest Directorate, Government of West Bengal, respective controlling officer and the funding Corporate.
4. The DPR shall also have separate provisions for third party monitoring after the completion of the project.
5. The divisions shall prepare their monthly account on online Tally software and send the same to CSR cell.
6. State CSR Cell shall be the coordinating agency for facilitation and reporting of progress of activity.
7. State CSR Cell shall be responsible for co-ordination between CSR partner and Implementing units.
8. CSR Cell shall produce an annual report on the status of CSR proposals in the State.
9. Monitoring of activities, fund flows, accounting and auditing, and disbursement of money to the unit offices shall be done by the State CSR Cell.
10. Responsibility of proper utilization of CSR funds shall lie solely on the implementing division and its controlling officer. The funding corporate may inform the CSR cell if it is not satisfied with the progress of work or if it finds that the project has not delivered the outcomes that were promised in the DPR. The CSR cell then conducts an independent inquiry and share its finding with all the concerned parties.
11. After the completion of project the agency receiving funds shall conduct a third party monitoring. The copy of monitoring report along with Project Completion Report, and PR/UC may then be sent to
 - a. The Forest Department through the CSR Cell,
 - b. The CSR Cell
 - c. The Funding corporate.

**GUIDELINES ON APPLICATION
AND UTILIZATION OF
UNMANNED AERIAL VEHICLES (UAV)
IN WEST BENGAL FOREST AREAS**

It is universally acclaimed today that the use of UAV in natural resources management has been proven very useful. Now it is felt that use of such UAV (drones) may be encouraged in forest and wildlife management for aiding conservation, surveillance and monitoring to control and curb forest offences and human-wildlife conflict. Application of UAV is necessary for various purposes viz. forest mapping, forest management planning, curbing forest encroachment, wildlife monitoring, monitoring of plantations, monitoring of forest fire, data collection and many other purposes. Ministry of Civil Aviation, Govt. of India instructions mandate only drones with certificate of airworthiness from the QCI (Quality Council of India). Except Nano Drones, all other drones must have a Unique Identification Number (UIN). Users/applicants have to approach for necessary certification and UIN from the Ministry of Civil Aviation through Digital Sky Platform launched by the Ministry to facilitate registration, licensing of drones etc. The pilot of a drone must have valid remote pilot license (except for a Nano Drone). One can apply for the said license after completion of drone pilot training from an authorized and DGCA registered institute.

Forest Directorate, Govt. of West Bengal is already in possession of a few micro drones and now it is necessary to train the staff as remote pilots and secure them with Remote Pilot License before deputing them in operating drones in compliance to Drones Rules 2021. Whenever new drone is procured, the same has to be registered with DGCA (Directorate General of Civil Aviation) as per mandatory compliance.

In view of above, following decisions are conveyed for use of drones in forest and wildlife management in West Bengal:

1. Use of drone is encouraged for forest and wildlife surveillance for taking pictures / videos which will be helpful for active management.
2. Thermal or Infrared cameras are suggested particularly in sensitive areas (wildlife rich and dense forest areas) for night visibility. The areas prone to wildlife depredation may be monitored with such camera fitted drones.
3. Each territorial and wildlife divisions may have two (2) micro drones and two (2) small drones. The small drones should be capable of mounting thermal camera for surveillance purpose.
4. Only safety audited servers should be used for storage of data generated by the drones. Stand-alone computers at divisions without internet connectivity may be used to protect the leakage of such data.
5. Medium drones with high resolution camera with longer flying time is required to be used in terrains like Sundarbans.
6. Medium drones with high resolution should be used in monitoring movement of elephants and human-elephant conflict.
7. Each territorial and wildlife division may train at least five (5) staff in drone operation from any DGCA recognized training institute. Such training institutes in the neighbouring states like Assam, Jharkhand may be approached for the same. It may also to be ensured that the trained staff get valid remote pilot licenses from the DGCA authority.
8. After successful training, the staff may be allowed to operate already available drones under supervision of DFO/ADFO.
9. Procurement of drones may be done only from the authorized / recognized concern / agency of DGCA and only as per prior approval from the Department of Forests, Govt. of West Bengal.
10. At present, use of drones is allowed with the prioritized forest areas of Sundarban NP, Jaldapara NP, Neora Valley NP, Singalila NP, BTR, Jhargram Division, Medinipur Division and Bankura (North) Division.
11. Proposals for drones operation may be initiated by the DFOs (territorial and wildlife divisions) and sent to the PCCF & HoFF through proper channel with observation of the CF / CCF for their jurisdictions.
12. Apart from above two (2) medium drones one each at South Bengal and North Bengal may be kept ready at

State Level (under control of the PCCF & HoFF) for use in emergency and urgent purposes and three (3) staffs each from South Bengal and North Bengal may be trained for operating the said drones with necessary valid license from DGCA.

**STANDARD OPERATING
PROCEDURE TO BE FOLLOWED
FOR DRIVING OPERATION OF
WILD ANIMALS.**

The state of west Bengal is endowed with different species of wild animals. Co-habitation of the human and wild animals is vary natural. There are many reasons of interface between wild animal with human being, leading to conflict.

Shifting of wild-elephant herd by means of driving is an age-old exercise followed by the Forest Department in West Bengal. This process has to be humane and violence free effort should be made only to drive the elephants from one patch of forest to another with compassion.

The use of extreme methods resulting in injury of the voiceless animals should be avoided at any cost. Assault by fire and sharp weapons should never be used in the course of driving of elephants. Recent circulation of audio-visuals in the Social Media is alarming and it is necessary that the following guidelines are required to be framed for driving the elephants in future :

1. The team / hulla party organized by the forest staff must be formed carefully. All the persons must abide by the rules and laws of wildlife protection while performing the duty. The persons engaged in such duty must be trained and well aware of the rules and *Dos and don'ts*.
2. Training should be organized for each and every one of the team and they should be made aware about their responsibilities for such driving operations. Provision of punishment for violation of any rule and *Don'ts* should be explained to all concerned.
3. No other person should be allowed to drive the elephants except trained hulla members.
4. Utmost priority of such driving operation must be to guide / drive the wild animals safely to their natural habitat unharmed. Any kind of cruelty to the animals must be avoided.
5. Dos and Don'ts of cruelty on elephants while driving is to be defined and given in writing to all the hulla teams.
6. Supply and use of burnt mobil oil should be exercised as per the guidance of the Forest Directorate and supplying of burnt mobil oil to villagers may be reconsidered and alternate option to be explored.
7. During driving, it is the responsibility of staff to identify the rule breakers among hulla team and villagers and report. This needs to be explained in writing to all the staff.
8. The participants / members of the team should maintain safe distance from the wild animal(s) so that no untoward incident / fatal accident happens due to retaliation of the wild animals(s).
9. No weapon, bomb and other harmful articles may allowed in such operations.
10. While driving of elephants, the relevant points of the *Constitution and Functioning of District Level Co-ordination Committee (DLCC), People's participation in managing Human-Wildlife Conflict, Dealing Law & Order situation in Human-Wildlife Conflict and Adoption of Early Warning System (EWS)* as specified in the Human-Wildlife Strategies issued vide No. 12442/CS/2M-1569/2021(Pt-II) Dated 28.02.2023 are to be exercised.
11. After any such operation the team leader(s) i.e. the forest field personnel must prepare a report of operation mentioning the performance and achievement. Indiscipline of members should not be tolerated and noted for action.
12. Awareness is to be created among staff and public that elephant is a National Heritage Animal and we should pay proper respect.
13. Appeal is to be made through Public Representatives, District Administration and Media to save elephants and not to torture or tease them.

**ECOTOURISM STRATEGY
OF WEST BENGAL
FOREST DIRECTORATE**

1. BACKGROUND

Ecotourism is defined as 'responsible travel to natural areas that conserves the environment and improves the well-being of local people'¹. Ecotourism is now globally considered as a powerful tool for conservation of forests, biodiversity, wildlife and landscapes. It has the potential to create significant opportunities for building public awareness and mass movement towards conservation of nature and nature resources while expanding overall returns to the economy, improving skill, creating sustainable alternative livelihoods for the forest-dependent communities. The unique bio-geographic zones of our State starting from snow-clad Himalayas in the North, Grassland-river-evergreen forests-wet lands of Northern plains, Central Gangetic alluvial zone, the Sal-Mahua-Piasal-Arjun dominated forest of laterite belt of Southern part and the world famous mangroves of Sunderban offers a great opportunity for exploring such places in a sustainable and scientific manner. In order to regulate and encourage planned development of areas in around protected areas, the MoEF & CC has recently notified 'Ecotourism guidelines in and around PAs 2021'. National strategy for Ecotourism has also been prepared taking into account wherein the Ecotourism guidelines of MoEF & CC. On this background it has become imperative to formulate and develop State-level Ecotourism Strategy and a comprehensive plan for sustainable ecotourism in forest and wildlife areas for our State also.

2. OBJECTIVES

- To promote and adopt low impact tourism in and around forest areas which ensures and protects the ecological integrity of the site and its surrounding environment.
- To promote conservation and protection of biodiversity, traditional ecological knowledge and aesthetic values.
- To provide livelihood opportunities to the local communities and other stakeholders.
- To facilitate the sustainability of Ecotourism enterprises and activities.
- To encourage sustainable use of indigenous, locally produced ecologically sustainable materials for tourism activities.

¹International Ecotourism Society definition of Ecotourism.

- To facilitate revenue generation for the Division, thereby aiding in Nature Resource conservation and development of forest fringe habitations.
- To reduce the dependence of fringe population on forests and giving them a reason to protect and conserve the forests and wildlife.
- To enhance potential of our state to become a leader in sustainable ecotourism management and ecotourism entrepreneurship development in our country.
- To promote partnership development among different stakeholders.

3. GUIDING PRINCIPLES OF ECOTOURISM

3.1 Ecotourism planning

- **Approval under Working plan/TCP/Management plan: the eco-tourism plan should be so designed that the area of operation must be within ecotourism zone as prescribed and approved under Management plan or Tiger Conservation Plan for PAs and Working Plan for Reserve Forest areas.**
- Carrying capacity assessment: Site specific Effective Permissible Carrying Capacity (ECC) should be assessed prior to implementation of ecotourism in the respective forest areas under PAs, Reserve Forests, Conservation Reserve, Community Reserve etc. While calculating the ECC, guidelines issued by NTCA may be followed.

- Control of plastic pollution: while formulating the ecotourism plan, provision for use biodegradable materials should be promoted and as such principle of complete ban on use of plastic products in and around PA's and notified Forest areas should be adhered to.
- Waste management, Sewage disposal/treatment: Plan should include Sewage disposal via an on-site sanitation system preferably through pit latrines, sanitary latrines, septic tanks etc. Biodegradable waste should be recycled through composting, vermicomposting etc. and method of incineration should be practiced for non-biodegradable waste.
- Noise management: The goal of noise management will be to maintain low noise exposures such that human health, wild environment well-being is protected. Use of low noise making vehicles such as bicycles, electric vehicle should be promoted.

3.2 Ecotourism zonation

- Plan should demarcate the eco-tourism zone upon assessment of management requirement as well as habitat, landscape & Ecological characteristics.
- Should ensure Ecological integrity of the site including breeding areas of wildlife, tribal habitation etc. remains protected.

3.3 Community participation

- Provide livelihood opportunities to the key stakeholders, JFMC members & local community.
- Transparent mechanism for revenue collection from common eco-tourism activities as user charges, Entry fee, Fines & penalties, Car parking fees, Road usage charges etc. through trust/foundation/State Development Agencies like WBSFDA.
- Sharing of revenue with the stakeholders i.e., with the JFMC members.

3.4 Resource mobilisation

Initial investment for setting up necessary primary infrastructure at potential ecotourism sites may be provided from WBFDC, Corporates through WBSFDA or from State Development fund for eco-tourism promotion.

3.5 Site development

- Shall be developed only in pre-identified eco-tourism zone.
- Should ensure and maintain natural profile & ecological integrity including biodiversity value of the site.
- No permanent structure should be constructed.
- Temporary structures/facilities made predominantly of locally available natural materials like Mud/Bamboo/Timber/Thatch etc. Structures like Tree house, Mud house, Tent, Thatch hut etc. should be promoted at the site for making overnight stay arrangement.
- Signages: Proper signage on the approach road should be displayed.

3.6 Inter-departmental coordination

- Coordination with police department, Block and Panchayat administration, Fire and Rescue Department, Rural Development, BCW and Tourism Department is a must in promoting and managing the ecotourism spot.
- Media engagement may also be taken up for widely promoting the ecotourism spot.

3.7 Entrepreneurship development

- Ways to develop entrepreneurship in local communities needs to be explored in and around the ecotourism spot.
- Farmer Producer Companies and Self Help Groups may be formed involving the community members for this purpose.
- The feasible activities may involve - Operation of food stalls by JFMCs, Setting up of Sales counter for floricultural produce and local handicrafts, Souvenir shop, sales counter for value added forest based products etc.
- Children's play area may be established comprising wooden structures for which entry fee can be separately charged by JFMCs to augment their income.

4. IMPLEMENTATION STRATEGY

Identification of potential sites.

Within Forest areas/PAs : shall form part of duly approved working plan/TCP/Management plan etc.

Within Eco-sensitive zones: shall be as per master plan of ESZ.

Within Forest Villages (FV's) and FD holdings :

4.1 Homestays - A homestay is an accommodation facility provided for visitors within an existing traditional private home owned by a local. The owner of the homestay should be residing in it and managing the operation. Any additions made for the convenience of visitors should be in line with the traditional design. Homestays will promote community based tourism and allow visitors to appreciate the socio-cultural milieu in natural environment. The proper guidelines will allow tourists to get the most out of their homestay experience and help to maintain the standard of homestays throughout the state. The process of homestay registration simple and accessible to all. The main objectives of the guidelines are to:

- Bring direct economic benefits to local villagers in areas with high tourism potential in the remote parts of the state.
- Ensure credible, consistent and uniform quality of services and facilities for visitors.
- Reduce the negative impact of tourism on traditional culture and local environment.
- Empower the community to promote sustainable tourism for their own economic development.
- Facilitate government support to local villagers in promotion of homestays.

4.2 Standard requirements & Registration - Homestay owners willing to operate must fulfil the standard requirements set by the Directorate of Forests. The following processes and steps are involved in registering homestays:

- All homestay promoters within the jurisdiction of Forest villages and F D Holdings, should be registered by the concerned Chief Conservator of Forests/Conservator of Forests after due recognition and recommendation of the concerned DFO.
- Interested individuals should submit an application to their respective DFO alongwith supporting photographs for recommendation.
- Concerned CCF/CF may constitute three member committee to assess category of homestay and recommend the application to CCF/CF for registration.
- On receipt of application, the concerned DFO will arrange for inspection of the applicant's house and facilities being offered.
- A certificate of recognition may be issued initially for a period of one year by the concerned CCF/CF upon receipt of the required amount in WBSFDA head of Accounts.

- The certificate will be renewed each year following proper verification by the concerned authority.
- Based on the facilities and quality of the accommodation provided by Homestay owner of FVs, Homestays may be classified into three categories: (i) Class 'A' (Diamond) (ii) Class 'B' (Gold) & (iii) Class 'C' (Silver).
- One time Registration fee and Annual renewal fee for such homestay categories is to be realised.
- Department may allow construction of maximum 2 (two) additional rooms attached to the existing homestead allotted in the FRA title deed.
- Additional 10% of booking amount should be levied on each Homestay booking as 'Nature Cess' or 'Service Charge' or 'Local Conservation Fee' and will be recycled for Eco-tourism development, livelihood development, HWC mitigation purposes of the particular Division through WBSFDA.
- Online booking of registered Homestays should be through portal of www.wbsfda.org

4.3 Identification of potential ecotourism activities in forest areas

- Promoting & regulating day visit in forest areas; Entry fee for entering forest areas for day visiting & camping purpose need to be realised from individual tourist/visitor.
- Promoting theme based tourism like, species, landscape, river, planting and camping etc.
- Jeep Safari, Elephant Safari in PA's.
- Jeep Safari in potential reserve forest area.
- Camping in pre-identified forest areas (Tent): School students, Corporate bodies, General tourists.
- Promoting special attraction sites in forest e.g. Water falls, unique landscape, big water Reservoir / Dam / Lake inside forest.
- Promoting trekking routes, Bird watching trails, Butterfly watching trails
- Bicycling, mountain bike in forest trail.
- Promoting sale counter for floriculture product, handicraft, value added forest based product; souvenir shop etc.
- Creating view points on unique landscape.
- Canopy walk, Tree top restaurant, River walk, Open air restaurant.
- Promoting adventure tourism e.g. River rafting, Zip line, Commando walk, Slack line, Burma bridge, Rock climbing etc.
- Organising special camp for bird watching, butterfly watching, biodiversity study, nature observation etc.

4.4 Forest Rest House (FRH) of WB can be broadly classified into Three (03) categories, viz.

- (1) Heritage Forest Rest House : established prior to independence and are still maintaining its original structure and shape or at least 50 years old. For example in North Bengal landscape following FRH should be considered as Heritage Forest Rest House (i) Sukna FRH (ii) Raidak FRH (iii) Gorumara FRH (iv) Chapramari FRH (v) Khutimari FRH (vi) Nilpara FRH (vii) Lava FRH. (viii) Rajabhatkhawa FRH (ix) Buxaduar FRH (x) WBF school, Dow Hill FRH (xi) Sandakphu FRH (xii) Chilapata FRH etc. There should be an effort to improve the condition and sustainably maintain it for the future.
- (2) FRH (Inspection) : These rest houses should primarily be considered as inspection bungalow for Officers of the Forest Directorate and other Govt. Departments. These should be made available to general tourists on non-official basis only when not required for inspection purpose, following the rules in vogue. For example in North Bengal landscape following FRH should be considered in this category :Jainty, Hatipota, Nimati, Raimatang, Silbunglow, Debibari (Coochbehar), Mathabhanga, Atiamochor, Lankapara, Sulkapara, Ambari, Kathambari, Tukriajhar, Odlabari, Mongpong, Bagora, Bamanpokhri, Takdah, Rambhi, Jorebunglow, Latpanchor, Kalijhora, Chopra, Kulik, Balurghat, Adina, Rimbik, Bengdubi FRH etc.
- (3) FRH (Eco-tourism): These rest houses should be primarily considered for promoting eco-tourism. For

example in North Bengal landscape following FRH should be considered in this category :Kumargram, Nimati, Rasomati, Gosanimari, Mendabari, Falakata, Bandapani, Bodaganj, Chunabhati, Mirik, Riyang, Lataguri (Neora Jungle Camp), Maneybhanjan trekkers hut, 7th Mile, Khairboni (Lohagarh) etc.

- There should be differentiated rates for booking of different categories of FRH for tourists.
- FRH earmarked for eco-tourism purpose can be booked through online portal of www.wbsfda.org or through [the portal of the WBFDC Ltd.](#)
- The first two categories of FRH should be booked by the concerned DFO through online request or application.
- All booking amounts should be deposited in WBSFDA Account, Subjected to approval and should be recycled to the concerned Division for maintenance and upkeep of the facilities.
- JFMC share for the third category only i.e. for FRH (Eco-tourism) booking should be decided on the basis State Govt approved JFMC resolution and order.

5. GENERATION AND RECYCLING OF FUND

- The rate of fee for ecotourism activities like Entry fees, Camping fees, Vehicle parking fees, Forest road usage charges, Jeep Safari charges, Elephant Safari charges, Boating fees, Photography fees etc. should be determined by the State Government.
- The fund thus collected may be earmarked to fund Human-Wildlife Conflict (HWC) mitigation, conservation and local livelihood development purposes.
- State Government should notify the rate of local conservation and these rates may be fixed differentially for PA's, Reserve Forest areas or other special areas like Mangrove area etc.
- The rate of fee shall be revised periodically taking into consideration the cost of operation.
- Implementing Divisions shall put in place a transparent mechanism for utilisation of these revolving fund, subject to approval, involving the JFMC members & other stakeholders.
- Eco-tourism receipts as approved should be regulated through WBSFDA or WBPCWS or BTCFT or STCF as the case may be.
- Receivable share of JFMC members out of ecotourism shall be 25% of receipts on account of tourist entry only, subject to approval.
- Balance fund (Transport entry, Road usage charge, Photography charge, Camping fees, Boating fees, Car parking fees etc.) should be recycled.
- Utilization of 75% amount should be regulated on the basis of APO & DPR duly countersigned by concerned CCF/CF and approved by Governing body of WBSFDA/BTCFT/STCF.

6. CAPACITY BUILDING

- Trainings can be organised by Forest Department for capacity building of the JFMC members. Infrastructure of WBF school at Dow hill or Rajabhatkhawa or Hijli may be utilized for organizing such training for JFMC members and frontline staff.
- Trainings may be provided on the subjects like Nature guide training, Bird guide training, Hospitality training, Entrepreneurship development training etc.
- Certificates may be provided by the department on successful completion of training.

7. BENEFIT SHARING

- Twenty five percent of revenue generated through entry fee will be shared with the JFMCs involved and as per JFMC resolution of the Govt.
- The revenue generated from food stalls, photo points, children's play area etc will totally lie with the JFMCs.

- Other benefits derived from Car parking charges, Road Usage charges, Car safari charges, Elephant safari charges, Boating fees etc. may be recycled for the purpose of HWC mitigation, Livelihood development purposes.

8. MONITORING

- An Ecotourism Monitoring Committee should be formed at Division level comprising the Divisional Forest Officer as Chairman and Assistant Divisional Forest Officer, Range Officers, JFMC representatives as members.
- The committee will meet on half yearly basis and review the operation and viability of the ecotourism spots and Homestays. The committee will identify the short comings and suggest correctional measures for enhancing revenue generation.

**GUIDELINES FOR USE
OF FIREARMS BY
FOREST STAFF ON DUTY.**

1. **Context and purpose**

Forest staff working in the districts of Alipurduar, Jalpaiguri, Coochbehar, Darjeeling, Kalimpong, Sundreban Tiger Reserve, South 24 Parganas and Elephant zones of South Bengal, need to use fire arms for personal safety, safeguarding and Govt. property and for protection of wildlife etc. Working in wildlife dominated areas also requires staff to carry fire arms to protect themselves from wild animal attacks. The main objective of arming the Forest officials is self-defense and to protect themselves, from unexpected attacks by miscreants and wildlife.

However, possession and use to fire arms and ammunition requires meticulous handling, compliance of rules and regulations, safety and upkeep of fire arms and ammunition. In order to ensure proper and legitimate use of arms and ammunition. The following guidelines are issued to for compliance.

2. **Definitions -** As per Arms Act 1959 Ammunition” means ammunition for any firearms, and includes—

- i rockets, bombs, grenades, shells 3 [and other missiles,]
- ii article designed for torpedo service and submarine mining,
- iii other articles containing, or designed or adapted to contain, explosive, fulminating or fissionable material or noxious liquid, gas or other such thing, whether capable of use with firearms or not,
- iv charges for firearms and accessories for such charges,
- v fuses and friction tubes,
- vi parts of, and machinery for manufacturing, ammunition, and
- vii such ingredients of ammunition as the Central Government may, by notification in the Official Gazette, specify in this behalf;

Firearms means arms of any description designed or adapted to discharge a projectile or projectiles of any kind by the action of any explosive forms of energy, and includes—

- i artillery, hand-grenades, riot-pistols or weapons of any kind designed or adapted for the discharge of any noxious liquid, gas or other such thing,
- ii accessories for any such firearms designed or adapted to diminish the noise or flash caused by the firing thereof,
- iii parts of, and machinery for manufacturing, firearms, and
- iv carriages, platforms and appliances for mounting, transporting and serving artillery;

Public Servant- has the same meaning as in section 21 of the Indian Penal Code (45 of 1860)

3. **Eligibility to Possess and Use Firearm.**

As per the Govt. of West Bengal, Home Department notification No, 1650-PL dated 8th April 1950, every such officer who is certified by Divisional Forest officer, of the rank of Forest Ranger, Deputy Ranger/Forester, Head Forest Guard, or Forest Guard of Forest Directorate can acquire the possession of one smooth bore gun for the purpose of self protection in course of his duties.

In addition, Govt. of West Bengal, Home Department Order No 4177-PI dated 5 - 5 – 1989 allows issuance of single barrel rifle of. 315 mm bore to Forest Ranger, Deputy Ranger/Foresters within the limits of Buxa Tiger Reserve, Gorumara, Chapramari, and Mahananda WL Sanctuary for self – protection and protection of wildlife.

Further the Govt. of West Bengal, Home Department Order no 7186-PL/PE/51-116/84 dated 22nd August 1991, authorizes issuance of single barrel rifle of .315 to Forest Ranger, Deputy Ranger/Foresters under territorial forest divisions viz, Jalpaiguri, Baikuntpur, Buxa Division, Coochbehar (present day Jaldapara and Coochbeha Division), Kurseong division.

Before issuance of above mentioned fire arms the following conditions shall be fulfilled.

- DFO should personally satisfy himself about the eligibility, age, physical fitness of the person to whom arms will be issued.
- DFO may get the, physical fitness of the forest staff certified by authorized Doctor.
- Such person should be put through training course before being given a rifle. Such training should be arranged by Training School, SFTI, or DFO with assistance of local SP. Minimum period of training of 15 days is prescribed.
- Rifle issue should be on absolute need basis.

4. **Training of Forest Staff**

Before being given a rifle, each forest should be provided with training by Training school, SFTI, or by DFO with assistance of local SP or police training institutes. Minimum period of training of 15 days is prescribed. Arms' training provided by WBNVF training center or by police training institutes.

The curriculum followed is as follows.

1. Regular physical Training Classes
2. Regular Drill Practice
3. Training (both theory and practical) on deployment during Emergency situations and Disaster management including Mock exercises
4. Training (both theory and practical) on Relief, Rescue and First Aid
5. Introduction to Rifle.
6. Laying position and halt, Aiming, Trigger control, safety, firing a shot, Range Discipline
7. Cleaning of firearms (Rifles and DBBLs), basic knowledge of arms and ammunition
8. Arms Firing Tests – Rifle training and Range firing by using 303 Rifle and 0.315 mm

5. **Use of fire Arm: How and when firearm can be used?**

Every Such officer of the Forest Directorate of Government of West Bengal such as Forest Ranger, Deputy ranger/ Forest, Head Forest guard or Forest guard who has been compelled in exercise of his right of private defense of person or property can use fire arms as per order no 1297- For dated 3rd February, 1940 and Notification No 1650-PI- 8th April, 1950, Govt. of West Bengal, Home Department order no 7186-dated 5-5-1989, and Govt. of West Bengal, Home Department order no 7186 PL/PE/51-116/84 dated 22nd August 1991. The forest officer of the above mentioned rank can carry smooth bore gun and single barrel rifle of .315mm for the purpose of self-protection in course of his duties and protection of wildlife, Govt. property etc.

There are no specific provisions of law in Indian Penal code, Criminal Procedure Code, Indian Forest act 1927(as amended), Wildlife Protection Act 1972 (as amended) etc. giving powers to forest officers to use fire arms. Like other citizens, Forest Officials as citizens and as Public Servants can exercise their Right of private defense. A forest officer using Fire arm should be able to amply justify the circumstances in which he had to use fire arms as a

last resort.

Forest official on duty must adhere to Section 96 to section 106 of Indian Penal code (1860 as amended) while exercising the right to private defense of the body and of property.

6. Legal and Regulatory Frame work: Protection available to Forest officer apart from the provisions of IPC 1860

a) Indian Forest Act 1927(as amended): Sec 74 provides indemnity for acts done in Good faith. No suit shall lie against any public servant for anything done by him in good faith under this act.

b) Wildlife Protection Act 1972 (as amended): Sec 60. Protection of action taken in good faith.-

1 No-suit, prosecution or other legal proceeding lie against any officer or other employee of the Central Government or the State Government for anything which is in good faith done or intended to be done under this Act.

2 No-suit or other legal proceeding shall lie against the Central Government or the State Government or any of its officers or other employees for any damage caused or likely to be caused by anything which is in good faith done or intended to be done under this Act.

c) THE CODE OF CRIMINAL PROCEDURE, 1973: Sec 197 Prosecution of Judges and public servants.

When any person who is a public servant not removable from his office save by or with the sanction of the Government is accused of any offence alleged to have been committed by him while acting or purporting to act in the discharge of his official duty, no court shall take cognizance of such offence except with the previous sanction of the Government.

However above mentioned sections of IFA 1927, WLPA 1972, and CrPC 1973 do not provide complete protection to forest staff with regard to Registration of FIR, Police investigation which may include arrest during the course of investigation of Criminal case.

Orissa, Assam and other states have extended the provision of Sec 197 of CrPC, and added proviso that, FIR registration/arrest can only be initiated by police after the enquiry by Executive Magistrate established that, firing was unnecessary, unwarranted and excessive. Efforts may be made by Forest Department, Govt. of West Bengal to get such an extension of protection under Section 197 of CrPC to Forest Officers in West Bengal, as has been done in the states of Assam & Orissa.

7. **Post Firing procedure**

Forest officer on his official duty if compelled to exercise right of self-defense of body or of property, can use fire arm subjected to the restrictions mentioned under Sec 99 of IPC 1860. While exercising the right to private defense of the body and of property, Sec 96 to 106 of IPC 1860 must be adhered to by the staff concerned.

Fire arm can be used in self- defense or protection of Govt. property, only, if there is a reasonable cause of the apprehension of death or of grievous hurt to public servant and there is no time to have recourse to protection of the public authorities.

Few warning shots in the air have to be fired to ensure dangerous elements/criminals don't get near to public servants with an intention to cause death or grievous injury.

Even then, if the criminal elements ignore the warning and forest staff is compelled to fire in self defense or in defense of his team members or of property, shall fire below the knees so as, not to cause death or grievous injury to persons who are indulged in committing forest offence such as, theft of Govt. property, trespass in prohibited areas,

poaching of wildlife, threatening public servants with serious injury or death. As far as possible, Non-lethal cartridges should be used by Forest staff.

In all the case where firing has been reported, a message should be sent by telephone / wireless / sms / whatsapp / messenger without loss of time to the following authorities.

- 1 Nearest Police station
- 2 Divisional Forest officer/Deputy Conservator of Forests/Deputy Filed Director
- 3 Conservator of Forests/Chief Conservator of Forest/ Filed Director
- 4 District collector/District Magistrate
- 5 Superintendent of Police
- 6 Sub divisional Magistrate of the area/SDO
- 7 Principal Chief Conservator of Forest & Head of Forest Force
- 8 Chief Wildlife Warden(in case of Wildlife Divisions)

Once firing has been done the following procedure has to be followed.

- The area need to be searched thoroughly, if any wounded person is there, he or she must be given first aid. The wounded and the dead if any must be removed as quickly as possible to the nearest hospital.
- As soon as this has been done, the senior forest officer present at the firing site shall draw up a full report of the occurrence, stating-
 - (a) The place of occurrence,
 - (b) The names of the forest officers present,
 - (c) The number of rounds fired,
 - (d) The number and the names of the persons killed and/or wounded,
 - (e) The measures taken to render first-aid and the hospital to which the casualties have been sent,
 - (f) An account of the events proceeding and leading to the firing including an explanation of the resort to firearms, and
 - (g) Any other relevant details.

In addition a criminal case complaint (FIR) must be lodged by senior most forest officer present at the site of firing, stating the account of events mentioned as above against the persons who committed forest offence and attacked forest staff on duty with intention to cause grievous hurt or death while they were performing Govt. duty.

This report should be prepared by the senior most staff present on the spot of firing and should be sent to the nearest Range Officer who will immediately forward it in original to the office-in-charge of the police-station within the jurisdiction of which the firing took place and shall also send a copy to the Divisional Forest Officer and to the District Magistrate.

DFO on receipt of a copy of firing report from Range office should report the matter to the District Magistrate and shall seek Magisterial enquiry into the incident.

Simultaneously DFO should get the firing incident enquired by gazette officer of the rank of ADFO.

District Magistrate on receipt of report from DFO and if injuries or death have been inflicted as a result of the firing, deposes a Magistrate to make a full inquiry to ascertain whether the firing was justified. This inquiry shall be executive or quasi-departmental and not a judicial inquiry. It should be independent of enquiries

made by the police or Magistrate under section 174 or 176 or other sections of the Criminal Procedure Code, but the evidence recorded in such enquiries may be used.

The report submitted by Range officer shall be laid before the Magistrate without delay to assist him in his enquiry. On completion of the enquiry, the Magistrate will submit report to District Magistrate who will send it to Government through the usual channel and a copy made over to the Divisional Forest Officer for submission to the Conservator of Forest/Chief Conservator of Forests.

Check list for Forest officer to follow once firing has been done:

- a Render first aid to injured person and rush wounded or dead the person to nearest hospital.
- b Senior forest officer present at the firing site, shall draw up a full report of the occurrence stating the events as detailed above.
- c Arms and ammunition including empty cartridges should be accounted for and the weapon used for firing should be preserved.
- d The Blank or empties have to be collected and kept in safety for further enquiry.
- e A forest offence has to be registered by senior Forest officer, seizure and recording the details as per the procedure outlined for booking Forest offence.
- f A FIR has to be filed immediately against the persons who committed forest offence and attacked forest staff on duty with intention to cause grievous hurt or death while they were performing Govt. duty in the police station having jurisdiction over the place of incident stating the account of events. In addition Forest offence has to be registered in the offence register.
- g A report prepared by senior forest officer present at the place of incident should be submitted to Range officer.
- h Range officer should send such report along with his findings to Divisional Forest officer.
- i Divisional Forest officer on receipt of report from Range officer should send a copy to District Magistrate and seek Magisterial enquiry into firing incident.
- j Simultaneously a DFO should constitute internal preliminary enquiry by a Gazetted officer and such enquiry should be completed before the Magisterial enquiry.
- k If situation demands anticipatory bail for Forest staff involved in the incident should be arranged.
- l Police protection should be sought to safeguard the families and property at Beat location and concerned Range.
- m DFO will collect all the details and send a detailed report to Principal Chief Conservator of Forests & Head of the Forest Force.

8. **Roles and Responsibilities**

- Divisional Forest officer is the sole authority empowered to issue Arms and ammunition.
- The arms and ammunition can be issued to Forest Ranger, Deputy Ranger/Forester, Head Forest guard, Forest guard on absolute need basis.
- Forest staffs that are trained in arms are only eligible to possess and use Fire arm.
- It is the Responsibility of Gazetted officer posted in the division to periodically physical check the arms and ammunition.
- Officer on whose name or designation, the fire arm and ammunition are issued, is responsible for their safe up keep and use.
- An officer supplied with ammunition shall be responsible for the return of empty cases.

9. Management, Care and custody of Government Fire arms and ammunition. (forest manual)
- A register Government arms and ammunition as per the form in forest manual or as per the format suggested by higher offices, shall be maintained by Divisional and subordinate offices.
 - A system of periodical physical check on such arms and ammunition by a Gazetted officer of forest Dept. is desired. ADFO Rank officer should do the physical check of Arms and ammunition. The check may be done once in every three months if not once a month.
 - A list of all such persons being issued with rifle should be maintained in the office of the DFO. A copy of which should be forwarded to SP of the district.
 - All arms and ammunition shall be kept under lock and key except when in use.
 - Divisional Forest officer shall be responsible for the care of Government arms and ammunition allotted to his division and for their distribution to his subordinates.
 - Arms and ammunition shall be issued only under the orders of DFO to forest officer either by name or by incumbent of particular post.
 - Arms must be cleaned at least once in a week and on each occasion of they are used. Officer shall be responsible for the safe custody of all arms and ammunition in their charge.
 - Without the order or permission of DFO an officer to whom fire arm and ammunition is issued shall not lend or transfer it any other.
 - In the event of any fire arm or ammunition being destroyed or lost full report must be submitted to the DFO by the officer concerned. Simultaneously it should be reported to nearest police station. After enquiry, DFO must submit the report with findings to Circle in charge and also inform the SP of the district.
 - An officer supplied with ammunition shall be responsible for the return of empty cases.

10. **Storage and Maintenance**

General Rules for safe storage of Fire arms

- Fire arm should be store unloaded
 - It should be kept separate from ammunition
 - It should be kept in safe locked container where unauthorized persons cannot gain access
 - Store in such places where moisture, extreme heat and cold are not present.
 - Arms should not be stored in remote places where there are chances of loot by anti-national elements.
- Safe cleaning: Regular fire arm maintenance is necessary for safety. Clean the fire arm as soon as possible after each use. Doing so ensures the firearm is in good operating condition for the next use. The first thing to do before cleaning a firearm is to check that the gun is not loaded. With the muzzle pointed in a safe direction and your finger outside the trigger guard, open the action; remove any ammunition present in the chamber. Check to see if the action works properly and use dummy rounds only. Never use live ammunition to check the action. After completing the safety check begin cleaning the fire arm. Disassemble the fire arm for cleaning as recommended in the manual.

11. **Documentation and Reporting**

- A Register showing the details arms and ammunition should be maintained at Divisional office and Range office.
- Whenever Fire arm in used, empties should be returned and same should be recorded in ammunition register.

- Annual statement showing the firearms and ammunition shall be submitted to Division by Every Range.
- Annual statement showing distribution of firearms shall be submitted to Circle in charge by DFO.
- Subordinate officers shall submit a monthly verification report to the Divisional office of the quantities of ammunition in hand.
- Annual statement of fire arms and ammunition shall be submitted to the Office of PCCF HoFF by all the Divisions. The wildlife divisions should submit such statement of arms and ammunition through the office of Chief Wildlife Warden to PCCF HoFF office.

12. **Review and Update.**

The guidelines should be reviewed as and when the Government notification with regard to fire arms, are modified or amended. If an update is mandated whenever amendments are included to relevant acts such as Arms act, IFA 1927, WLPA 1972, CrPC, IPC same may be updated. Guidelines may be looked into its relevance after every 5 years and necessary modification may be carried as required.

**GUIDELINES FOR
SOCIAL FORESTRY
IN WEST BENGAL**

Guidelines for Social Forestry in West Bengal

Introduction

Social Forestry is defined as “Forestry outside the conventional forests which primarily aim at providing continuous flows of goods and services for the benefit of people. The objective of Social Forestry is to provide environmental sustainability, windbreak and soil improvement, supply of fuel wood, timber, fibre, food, shade and fodder thereby contributing significantly to improving rural livelihood.

In 1976 the National Commission on Agriculture in India popularised the concept of social forestry to encourage those who were dependent on fuelwood, fodder and other forest products, to meet their own needs through various activities in order to reduce the burden on the forests and to provide employment opportunities and to increase family income considerably to alleviate poverty, reclamation of degraded lands, conservation of soil and moisture, improvement of agricultural production and prevention of environmental deterioration and to help restore ecological balance. Thus, Social Forestry is also called as “forestry of the people, by the people and for the people”.

In West Bengal Social Forestry had a golden innings during 1970s and 1980s. The old glory of Social Forestry in the State should be revived. Emphasis is to be given on planting of Agro-forestry and Farm-forestry species, and for this it was felt that a suitable guideline needs to be framed.

Forests provide a wide range of tangible benefits like timber, fuel wood, fodder and Non-Timber Forest Produces (NTFPs), and intangible benefits like ecological services, hydrological benefits, soil conservation, flood control, carbon sequestration, biodiversity resources etc.

In recent times, the value of less tangible services, such as climate control, water filtration, soil fertility, as well as recreational and cultural services has become more apparent. As understanding deepens about human dependence on natural processes across varying temporal and spatial scales, so too does the need to measure and value these 'ecosystem services' within economic and management frameworks.

Human societies have long been aware of their reliance on the goods and services provided by nature, especially food, fuel and fibre. The ever-expanding human population of the State requires an enormous amount of wood, which in turn, puts intense pressure on the existing forest wealth of the State. As land is a limited resource, further expansion of recorded forest area has almost reached its limits. Therefore, exploration of other domain areas such as Social Forestry is the need of the hour.

Agro-forestry and farm forestry have taken deep roots in the country and Trees Outside Forests (TOF) are contributing to the increase in tree cover and enhancing ecosystem services, while meeting a bulk of the country's wood demand and providing climate resilient incomes to the farmers.

It is, therefore, imperative that to meet the burgeoning demand more areas outside recorded forests in the State be brought under Social Forestry, in service to the people of the State. Promotion of wood use obtained from

sustainably managed forests and trees would play a significant role in mitigating effects of climate change, ensuring sustainable living and achieving economic parity.

Basic objectives

- i Encourage and expand tree plantation in complementary and integrated manner with crops and livestock to improve productivity, employment, income and livelihoods of rural households, especially for the small holding farmers.
- ii Protect and stabilize ecosystems, promote resilient farming systems, and to reduce the risk of ecological damage during extreme natural events in vulnerable regions with focus on the hills.
- iii Promote Mangrove Coastal Shelter Belts in the coastal districts to minimize cyclone damage and resource loss.
- iv Meet the raw material requirements of wood-based industries and to reduce the import of wood and wood products to save foreign exchange.
- v Supplement the availability of agroforestry products (AFPs), such as the fuel-wood, fodder, non-timber forest produce (NTFP) and small timber of the rural and tribal populations, thereby reducing the pressure on existing forests and pastures.
- vi Complement achieving the target of increasing forest/tree cover with reduction in carbon footprint.
- vii Develop capacity and strengthen research in agroforestry and create a massive people's participatory movement for achieving these objectives and to minimize pressure on existing forests.
- viii Promote green in urban areas.

20 Point Strategy

Promotion of urban and rural greens and other trees outside forests will be taken up on a mission mode in the State for attaining the national goal of bringing one third of the area under forests and trees cover, and for achieving the Nationally Determined Contribution (NDCs) targets of the country. The following measures are envisaged for West Bengal :

- i Boosting of agro-forestry and farm forestry through proportionate operational support systems, including providing scientific interventions and genetically superior planting materials to improve productivity of degraded and / or underutilized public land.
- ii Taking on of a collaborative approach in social forestry with Forest Department as a technical partner and facilitator in collaboration with private tree growers, institutions, companies, cooperatives, other government entities and others.
- iii Adoption of the role of a technical guide by the Forest Department to advise on the species choice from a repository list of suitable plant species while safeguarding local biodiversity, preventing exotic and invasive species introduction and their proliferation.

- iv Designing of projects on commercial mode with viable business model e.g. on farmlands. Financial viability through robust business plan as part of project design shall be the key for Social Forestry projects to move from planning and initiation stage to build-up, eventually scaling up with wider outreach in course of execution.
- v Promotion of cultivation, harvesting, transportation and marketing of timber from trees on non-forest areas by carrying out administrative reforms and implementation of Ease of Doing Business (EODB).
- vi Development of suitable location specific Public Private Partnership / Joint Venture models involving State Department, West Bengal Forest Development Corporation, West Bengal Pulpwood Development Corporation Limited and other state PSUs, public limited companies, educational institutions, residential colonies, panchayats and other local authorities, Joint Forest Management Committees and local communities for achieving the target of increased forest and tree cover in the state.
- vii Formulation of zone specific plantation models for greening of mined out areas and land beside railway tracks, highways, village roads and median boulevards, keeping in mind the government norms of rail / road and local authorities, including short rotational pulp-wood plantation models for meeting industrial demand, and Accredited Compensatory Afforestation (ACA).
- viii Exploring certification of sustainably raised plantations and sustainably harvested forest products including handicrafts to increase international market acceptability and earning of foreign exchange.
- ix Assisting in pre-production agreements between the farmers and the forest based industries for price assurance to the farmers.
- x Popularization of cultivation of timber species with enhanced economic values such as Agar wood, Red sanders, Sandalwood, etc. in the social forestry sector.
- xi Facilitation for inclusion of agro forestry and farm forestry in the agricultural crop insurance scheme.
- xii Preparation of management plans for meeting social forestry objectives in consonance with urban development plans for towns and cities.
- xiii Inclusion of fruit bearing trees in strip plantations and plantations along avenues, canal bank, river bank and around water-bodies in collaboration with Horticulture Department and agricultural universities, thereby ensuring food and nutritional security for the rural population, and for providing food for wildlife outside forest areas. Such trees are also an invaluable source of traditional medicines for the local communities.
- xiv Demarcation of green corridors in vested lands and tea gardens for human-wildlife conflict mitigation and resolution.
- xv Introduction of user friendly e-platform / mobile apps to seamlessly integrate project elements like inputs (e.g. nursery raw materials) with actions (e.g. seedlings to be planted at site) and output (e.g. monitoring / protecting trees at site, harvesting, disposal, transit pass, etc.).
- xvi Designing, implementation, monitoring and data analysis of scientific research and pilot projects continuously for results, replicability, scaling-up and course-correction in project design based on necessity.

- xvii Standardization of nursery techniques in terms of identified seed sources, technology, seedling inventory management, quality management, transport chain to site, etc.
- xviii Encouraging schemes like Nagar Van / Nagar Vatika for municipal areas and School Nursery Schemes to draw benefits from Government of India funding and planning.
- xix Campaign for awareness and publicity of extension services for agro forestry and farm forestry for greater public outreach.
- xx Building up of cyclone resilience through proliferation of coastal shelter belt plantations, especially of mangroves, and other such interventions.

Major thrust areas for West Bengal

1. Boosting Social Forestry through appropriate support systems -

It is important to identify clearly to whom the social forestry project should be addressed: general individuals, the community as a whole, or specific groups. The identification of target groups for social forestry will not be based only on the specific needs of different rural population segments, but also upon more general societal objectives. Therefore, collective planning and action is favoured as a way to allow democratic participation even of poor, landless people, and as a way to distribute benefits equally.

Forest Department can help by providing quality planting material and other inputs for farm forestry / agroforestry species and technical support for raising plantations on available wasteland / revenue / panchayat / private land outside forest. State Government may start nursery outlets for sale of quality seedling in each administrative unit. In addition, private nurseries may be registered under Social Forestry Divisions.

2. Designing Social Forestry projects on a commercial mode -

Economically viable social forestry should encompass commercial operations structured and managed to be profitable without adversely affecting the local communities or the environment. In a limited scale social forestry may, in addition, be non-commercial e.g. creation of fully conserved woodlands / avenues for awareness / education on indigenous tree diversity or wildlife corridors. Trees outside forest (trees growing outside recorded forest areas) are vital in generation of valuable ecosystem services in both rural and urban areas of West Bengal. Economically and ecologically trees outside forest impact livelihoods. Timber and wood panel products from social forestry areas reduce pressure on forests as valuable alternatives to timber of forest origin.

3. Administrative Reforms and Ease of Doing Business in Social Forestry sector -

Special emphasis is required to be given in organisational restructuring of Forest Directorate by restoring the Social Forestry Wing for optimal achievement of targets of tree cover in the State.

Options need to be explored for reducing the burden on the grower as per the Ease of Doing Business. Amendment in Transit Rules and rules relating to saw mills are essential and are being contemplated to contribute to growth of

social forestry in West Bengal.

It has been felt that agroforestry can be promoted more if the Acts and Rules are amended so that those are more of regulatory than of prohibitory in nature. MOEF&CC has also issued guidelines from time to time advising the nature of role of Forest Department to be of giving technical inputs.

West Bengal Forest Produce Transit Rule 2019 exempted 26 species from the ambit of the Transit Rule by a notification issued in 2020. Translocation of trees are being introduced through amended West Bengal Trees (Protection and Conservation in Non Forest Areas) Act, 2006.

4. Development of suitable location specific PPP/ JV models for achieving targets of increased tree cover through Social Forestry -

Formal collaboration agreement may be executed between companies and beneficiaries who are the owners of encumbrance-free plots of land and who are willing to raise short rotation pulpwood thereon. The Company provides technical and financial inputs for creation, tending and harvesting while the beneficiary provides the land. Protection of the plantation remains a joint responsibility. Harvested produce is sold through auction / tender, negotiation, or allotment to wood-based industries. The sale proceeds are shared between the Company and the beneficiaries on a pre-agreed ratio. In addition the beneficiaries may grow fodder grass / intercrops or collect dried leaves and twigs, but are not allowed to fell trees, cut branches or collect fresh leaves and flowers.

Payments for ecosystem services (PES) are incentives offered to farmers or landowners in exchange for managing their land to provide some sort of ecological services their lands produce while adopting sustainable land use management techniques such as agroforestry and Farm forestry. PES schemes involve payments to the managers of land or other natural resources in exchange for the provision of specified ecosystem services. Specific ecosystem services were identified and assessed by Millennium Ecosystem assessment of UN. The major ones are climate change mitigation, watershed services and biodiversity conservation, and demand for these services in particular is predicted to continue to grow as time goes on. Farmers can be encouraged to avail the benefits under such schemes for carrying out agroforestry and farm forestry in their lands.

Agroforestry has recently gained traction as a strategy for climate mitigation through sequestering carbon and reducing greenhouse gases emission. Agroforestry systems have been identified as having the highest potential for carbon sequestration by 2040 among all land use practices. The two types of carbon trading markets viz., regulatory/compliance market and voluntary markets can be tapped to provide benefits to farmers through trading of certified emission reduction units.

5. Formulation of zone-specific plantation models for greening through Social Forestry -

Avenue plantations

Avenue plantation and strip plantation on both the sides of the Highways, Railway tracks and village roads aims to increase tree cover in the districts to reduce pressure on the forests in conformity with the National Forest Policy 1988. These plantation models are generally subjected to stress factors like pollution, encroachment and grazing in a higher degree. The species to be planted in the model should ideally provide shade, enhance aesthetics of the

zone, be of fast-growing nature and be resistant to grazing.

Greening of mined spoils -

There are extensive mines and quarries, especially in South Bengal, mainly for coal deposits and stone extraction. Most are open cast mine where the material is removed from the upper layers. After the mines are exhausted the tunnels, burrows and caverns are supposed to be filled in with sand and stabilised by plantation on top to restore the ecosystem. The plantation plan for mined out areas are an integral part of the mining plan and have to be submitted for grant of mining lease. It is desirable that the local forest officials take on a more proactive role in formulating the plantation plans rather than endorsing plans prepared by the companies. Emphasis need to be kept on local and indigenous species which can support wildlife and local rural population rather than exotic trees. Planned order of plant succession and proper remediation measures should be incorporated in the plantation model to re-vegetate the mine spoils.

Accredited Compensatory Afforestation (ACA) -

ACA is new concept introduced through the Forest Conservation Rules 2022 for which necessary guidelines are under finalization by the Government of India. Interested persons or entities are encouraged to raise plantations of mainly indigenous species on non-forest land which will be accredited after inspection by the Forest Department. ACA may be swapped by said persons or entities for financial consideration with prospective User Agencies applying for diversion of forest land under Forest Conservation Act 1980. This scheme will promote onset of flow of ecosystem goods and services in advance and also open a new channel for financial investment in the social forestry sector.

6. Exploring certification in Social Forestry -

System of voluntary accreditation and independent third-party certification need exploration for well managed social forestry plantations that are environmentally appropriate, socially beneficial, and economically viable. The system would enable the certificate holders to market their products and services as “certified” which commands acceptance and premium economic returns, especially in the international markets. It is expected that in West Bengal most social forestry operations will be by small holders. There may be a few larger players such as tea gardens.

Priority therefore should be on development and adoption of certification standards for small holders, communities and cooperatives who have limited capacity with low impact operations. These plantations may include boundary trees, spinney, woodlots, orchards, or agroforestry plots in linear, strip or block forms of upto 20ha per member family. Standards should cover both timber and non-timber products, including handicrafts.

7. Popularization of plantation of high economic value timber species

Agarwood -

Agarwood tree (*Aquilaria malaccensis* Syn. *A. agallocha*) is distributed in all the North-Eastern states. Agarwood

oil is the resinous substance in its heartwood which develops against a certain fungal infestation. It is a highly valuable product for medicine and fragrance industry. Considering its economic significance, an initiative has been taken for Agarwood trials in suitable sites of North Bengal which in turn will boost economy of fringe population through conservation and benefit sharing mode in future.

Sandalwood -

Sandalwood (White Sandal) is the fragrant heartwood of *Santalum album* tree. *Santalum album* is mainly distributed in the Deccan Plateau. The economically important sandalwood are completely or partially root parasite in the initial stages with Tulsi, Arhar or Nayantara. Sandalwood was grown on trial in various forests compounds located in the districts of Bankura, Birbhum, Burdwan, Purulia, and Paschim Medinipur by bringing quality seeds from Tamil Nadu Forest Department and Institute of Wood Science and Technology (IWST), Bangalore. Germination of Sandalwood seeds is found profuse from the bird droppings in the forest floor as well as in the village yards and bunds of the agricultural fields. Sandalwood can grow in comparatively poor agricultural soil and in laterite tracts but it needs good soil depth with organic matter and without water logging. Distribution of sandalwood seedlings along with its host plant needs to be done in large scale for the population to reap long term benefits. Nursery and Plantation techniques are given in separate leaflet.

Red Sanders -

Red Sanders (Rakta Chandan) tree (*Pterocarpus santalinus*) is a moderate sized deciduous tree with an erect bole and a dense rounded crown. Its natural range is peninsular India and has successfully acclimatized in South Bengal. The potential areas in West Bengal are Jhargram, Paschim Medinipur, Bankura, Purulia, Birbhum and Paschim Burdwan districts. The heartwood is extremely hard and dark red in colour. The inner bark of the tree, when injured or cut, oozes out red coloured 'santalin' dye which has many commercial uses. The heartwood is very expensive due to a lucrative overseas market. Nursery and Plantation techniques are given in separate leaflet.

8. Promoting urban greens -

Urban greens include woodlands, wetlands, parks, wood in institutional areas, gardens, avenue plantations, block plantations etc in such areas. These green patches bring many aesthetic, recreational, environmental, and economic benefits to cities and their dwellers. They need to be managed as urban forest ecosystems to enhance optimal urban forest cover and to nurture and sustain urban health, clean air, and related benefits. Smriti Van and Nagar Van are such schemes aimed at mainly municipal areas. Management plans may be prepared and implemented in consonance with the development plan of cities.

9. Popularising fruit bearing trees / fodder plantations and bamboo cultivation -

Due to population pressure the village commons are vanishing. Efforts need to be made to provide for fallow land patches to raise bamboo at least for local consumption. Large scale production aiming to meet industrial demand is ideal, and need to be explored. Planting fruit bearing trees along banks of river, canal and water-bodies and along

roads and railway tracks provide food and nutrition for the villagers. Most of these trees, in addition, act as source of traditional medicines. These also support wildlife specially monkeys, bats and birds. During sapling distribution programmes emphasis may be kept to supply such species of fruit trees. Tie ups may be explored with Horticulture Department.

10. Building up of cyclone resilience through Coastal Shelter Belt plantations -

The coastal districts of West Bengal are lashed every year by cyclones which cause widespread resource loss. Mangrove plantations are especially effective in building up resilience towards climatic onslaughts. Mudflats and plantable zones in creeks need to be intensively planted with viviparous Quality Planting Materials of Mangrove species both within the forest areas and outside demarcated forest boundaries for optimum impact. Technical inputs of plant growth promoters including of rhizosphere microbes identified in the Sundarbans may be considered while raising such mangrove plantations. *Casuarina* used to be a very popular social forestry species for fixing of sand dunes along West Bengal coastline. Re-emphasis on *Casuarina* is essential. Grasses and creepers which come up naturally on mudflats and sand dunes should not be removed since these help in soil conservation.

11. Wildlife corridors -

Plantation should be encouraged in the vacant tea-garden land in North Bengal which will double up as corridors for movement of wild animals. Raising social forestry plantations of high-quality timber species which will give more economic value as raw materials for industries need popularisation. Planting fruit bearing trees will also support wildlife specially monkeys, bats and birds. In addition, these generate rural employment opportunities, ensure soil conservation and environmental sustainability.



