

NWFP Environmental Protection Agency

Environmental Assessment Checklists and Guidelines

Non-Regulatory

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 1 of 10
-----	------------	-------------------	--------------

Contents

1. Introduction	1
1.1 How to Use These Guidelines	1
1.2 Glossary	1
2. Guidelines for Afforestation/Reforestation Programmes	3

1. Introduction

It is clear from the environmental account in the literature that total forest area and tree stock in Pakistan are very small and these are totally insufficient to meet the ecological, environmental, social and economical needs in the country. This has been strongly stated in all forest policies announced by the Government from time to time. A detailed forestry sector problem analysis and future development program have been given in Pakistan in recent years through National Conservation Strategy (NCS) and Forestry Sector Master Plan. (FSMP). In these plan stress have been given on environmental issues such as global warming, greenhouse gases (GHG) mitigation and abatement, conservation of biodiversity, etc. which are now alarming for great environmental deterioration. Present guidelines are for the all such projects under the light of which any

reforestation and reforestation will be carried out.

1.1 How to Use These Guidelines

These guidelines will supplement all existing technical manual and guidelines for plantation.

The guidelines are produced for general information. No approval from the Environmental Protection Agency for forest harvesting is required.

1.2 Glossary

Angiosperms plants having seeds in a closed ovary

Assetless: Residents of a village who do not have any immovable assets like land and house.

Crop Management: Judicious management by way of combination and

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 2 of 10
-----	-------------------	--------------------------	----------------------------

rotation of crops for optimum productivity.

Centrally Sponsored Schemes: Are those where part of the funding of the Plan is borne by the State Government and Government of NWFP.

Common Property Resources: This term covers all land which can be accessed by all residents of the village and would include village commons, Governments lands available for grazing etc.

Drainage Lines: Would define the flowing of water from ridge to the common point of drainage through the various channels.

Dicotyledons (of a flowering plant) having two cotyledons in the seed

Ecological Degradation: Deterioration in environmental condition including erosion, atmospheric pollution, deforestation, water and noise pollution etc.

Gymnosperms plants of the class Gymnospermae having seeds not enclosed in an ovary

Homogenous Groups: Are those groups which because have cultural or caste or common interests or common source of earning are willing to work to a common goal.

Indigenous Technical Knowledge: Is knowledge that is available in the village through the cumulative historical experience of a community/individual

Monocotyledons (of a flowering plant) having two cotyledons in the seed

Non-Forest Areas: Areas other than the Notified Forest areas including Reserved, Protected, Unclassified Forests.

Participatory Rural Appraisal: Involvement of the rural people in undertaking survey of natural resources and prepare perspective plans based upon the needs of the people.

Self Help Groups: Would be homogenous groups having common identity such as agriculture laborers, women, and shepherds, Scheduled Castes/Tribes etc.

User Groups: For each work/activity the Forest Department would identify a group of people who may be affected most, either beneficially or adversely.

Usufructs: The produce that would flow from the development of watershed area and would include water, grasses, twigs, minor timber, fodder, fruits, fibre and other produce like lac, honey etc.

Vegetative Barriers: Vegetative measures for protection against soil erosion by using species like Agave, Vetiver, grasses, shrubs, trees etc.

Village Community: Would include all the residents of a village.

Wastelands: Land which is producing below its full productive capacity and which can be improved through a reasonable investment.

Watershed: A watershed is a geohydrological unit or an area that drains at a common point.

No:	Version: B	Date: 21 May 2004	Page 3 of 10
-----	-------------------	--------------------------	----------------------------

2. Guidelines for Afforestation/Reforestation Programs

Following are the guidelines for afforestation/ reforestation programmes

- ▶ As mentioned earlier climate is one of the main determining factor for existence of different types of vegetation including forests all over the world, so always select those species which are suitable to the climate of the area.
- ▶ Where to plant is generally a collective decision made by policy makers, foresters and the planting crews, based on information obtained in the site reconnaissance. The key is to select the site that, when planted, will lead to the establishment of a successful forest plantation. Often, the choice of the planting site is limited to lands that are not suited for agriculture or livestock production. When this is the case, the site reconnaissance information gains importance.
- ▶ The boundaries of the planting site, once the area has been chosen, should be marked with boundary posts. When there is a danger of trespassing and damage by grazing animals, a boundary fence should be established. Fencing is costly and, therefore, should only be built when other means of protection are not effective. Once a forest plantation is well established and the trees are sufficiently tall, the fences can be removed and reused at another planting site.
- ▶ Perennial woody plants that develop along a single main trunk to a height of at least 4.5 m (15 feet) at maturity will be selected for the reforestation process (not taking in consideration the pioneer species of trees to be implanted previously and the vegetal species that will grow naturally in the reforested sites after the planted trees achieve a satisfactory height). This is the classical definition of what is a tree.
- ▶ Preference to planting dicotyledonous (broad-leafed) species of trees. There are many reasons for giving preference to Dicotyledonous trees. They grow in a larger variety of soil types than the gymnosperms (coniferous) or Monocotyledons (palms) trees, and its constant leaf-fall contributes for the health of the soil. The root systems of dicotyledonous trees are also bigger and more complex than the ones of other species. Their broad-leaves decompose quicker and more efficiently than the leaves of palm trees or coniferous; this not only increases the humus in the soil, as already mentioned, but also avoids the formation of wildfires. Other important characteristics of dicotyledonous trees will be discussed later on.
- ▶ For a successful planting, performance data may have to be extrapolated from one locality to another. Results from a locality where a tree species is growing strictly apply only to that locality. Their application in another locality involves the assumption of site

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 4 of 10
-----	-------------------	--------------------------	----------------------------

comparability, an assumption that may or may not be justified. When reliable information shows a close similarity between the site to be planted and that on which the species is already successful, it is generally possible to proceed to large-scale planting with confidence.

- ▶ The selection of the tree species through the use of analogous climates is important as a first step. But this must be amplified by an evaluation of localized factors that can be more important (for example, soil, slope and biotic factors). However, the ability to match closely a planting site and a natural habitat may not preclude the need for species trials, since climatological or ecological matching may not reveal the adaptability of a species.
- ▶ When the tree seedlings arrive from the nursery, the site should have been prepared to ensure that planting could proceed without delay. Site preparation in arid zones is very important. It serves to create conditions that will enable the soil to catch and absorb as much rainfall as possible (when it would occur). Surface runoff should be reduced to increase the moisture in the soil. It serves to provide good rooting conditions for the planting, including a sufficient volume of root able soil. Hardpans must be eliminated. Danger from fire and pests must be minimized.
- ▶ Site preparation is directed towards giving the seedlings a good start with rapid early growth. In general, the methods used to achieve site preparation will vary with the type of trees to be planted, amount and distribution of rainfall, presence or

absence of impermeable layers in the soil, the need for protection from desiccating winds and scale of the planting operations.

- ▶ In general, preparation of the site by hand is possible and economical only for relatively small-scale projects, where the labor of clearing the competitive vegetation and working the soil is not too time-consuming. Under certain conditions, animal-drawn ploughs and harrows can also be economical for small-scale operations.
- ▶ Mechanical soil preparation, used increasingly in large-scale planting programs, has become a common practice in many areas. Often, this is because the supply of labor and the time available for ground preparation are too limited to permit large-scale projects to be undertaken by hand. Operations such as deep sub soiling and the breaking up of hardpans can only be done by machines.
- ▶ Whatever method of site preparation is used, a planting pit (of an appropriate size) should be prepared. The objective of creating planting pits is to aerate and loosen the soil in which the plants will grow. When these planting pits are prepared, they should not be left empty with the excavated soil lying on the ground, but refilled immediately, otherwise sun and wind will dry out the soil completely.
- ▶ Planting holes of 0.4m of height x 0.4m of length x 0.4m of width at a density of 5m x 5m (intercalated with the previously planted pioneer species) are indicated for most of tree species. The soil preparation can be carried out in patches, strips, or by complete cultivation. Other

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 5 of 10
-----	-------------------	--------------------------	--------------

methods of soil preparation by hand are the ash-bed method, tie ridging, contour trenching and terracing, and the steppe method

- ▶ Planting of containerized stock is usually done in holes that are large enough to take the containers or the root-balls when the plants are removed from the containers. It is essential that the surrounding soil be firmed down around the plant immediately after planting to avoid the formation of air gaps, which can lead to root desiccation.
- ▶ While selecting species for a particular plantation, two kinds of factors (determinants) have to be considered. The site-specific factors are the ones related to the site. The goal-specific factors arise out of the basic aims and objectives of the plantation.
- ▶ In order to prepare a list of species to be used for a particular plantation site, one has to consider the most restrictive site-specific factor. Against this determinant one looks up the set of species. This set of species is compared against all the sets corresponding to other determinants, both site specific and goal specific. The final subset as a result of successive set intersections represents the possible species for that site.
- ▶ However, in real life situations there are factors other than those relating to the site and the goals of the programme. These are ancillary determinants. For example, some gives four species that fulfil the requirement of the basic aims of programme and are suitable for the site, certain of these species may mean higher unit costs not provided in the programme. Or the cultural preferences and local beliefs may make certain species preferable to others. Many other factors like these may affect the final choice. However, no quantitative weight can be assigned to indicate the importance of these factors. Nor can sets of species be determined, since the factors themselves are indeterminate. Therefore the list of species selected on the criteria of basic determinants should be tested against these soft criteria on non-formal basis.
- ▶ In many cases cultural preferences or the basic aims and objectives of the programme make it necessary that a particular species must be included in the programme even if it will not suit the conditions obtaining at the site. For instance, the site may be rocky, and therefore a particular species cannot be chosen. In such cases it may be necessary to provide for special measures to overcome the limitations of site. It may be noted that such measures will raise the unit cost of the plantation, and therefore cannot be included as a general practice in large scale afforestation programmes
- ▶ It is possible to identify broad groups of site-specific factors associated with particular land and terrain types. Considering these it is possible to construct ready reckoners that provide the list of species suitable for a particular type of terrain or climate.
- ▶ Planting should be done in the time when maximum availability of water is possible. The changes in moisture regimes that occur in forest soils depend on many factor e.g. precipitation, texture, vegetation,

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 6 of 10
-----	-------------------	--------------------------	----------------------------

drainage etc. that varies slightly between different areas of the country. Selection of recommended planting dates is based on the following three considerations:

- ▷ The optimum planting season occurs when a positive water balance can be expected as indicated by average temperature and rainfall in the climatographs.
- ▷ Planting should be initiated at the beginning of the season so that trees have a chance to establish root system, which can support the trees through dry periods that follows both season.
- ▷ Supplemental watering and irrigation would broaden the planting “window”, or that period of time when planting is feasible.
- ▶ Nursery options are directly influenced by the intended planting date the nursery schedule of activities for soils preparation, sowing and maintenance should be timed to the specific. Target dates.
- ▶ As general rule, the timing of site preparation is the function of planting date. Site to be planted in winter should be prepared in October to December and sites to be planted in monsoon should be prepared in April to May.
- ▶ Site preparation include brush clearing, removal of roots, burning, ploughing, pit digging and terracing. These activities are generally facilitated by dry environmental conditions. Although some soils moisture helps in working soil, wet conditions adversely affect soils structure by causing soils compaction. Also, machine efficiency is decreased by wet soils.
- ▶ In those areas where site preparation requires only the digging of pits, then it is probable best done in the month preceding planting.
- ▶ The plants can absorb mineral only in solution form. Adequate soils moisture is therefore necessary to solubilize fertilizers and make it available.
- ▶ On the other hand, excess moisture may carry away minerals before the trees have a chance to use them. The most optimum utilization of fertilizers depends on long-term availability. Late June and early July is generally the proper time for tree fertilization. The monsoon rains will make the fertilizers available to plants and a response is more during this period of fast growth.
- ▶ Easily eroded sites, such as steep slopes or sandy soils should be fertilizing in December. For these sites, heavy monsoon rains may carry away fertilizers before the plant can use them. Even so, this recommended is only for evergreen species such as, *Eucalyptus camaludensis*.
- ▶ In case of irrigated stands, the optimum time for fertilizing is the beginning of spring bud break.
- ▶ Stands should be thinned when the maximum growth response from the remaining trees can be expected.
- ▶ The fastest growth probably occurs in the monsoon season, which implies that stand should be thinned in May and June. Two important other factors should be considered, however, first, thinning might expose

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 7 of 10
-----	-------------------	--------------------------	----------------------------

the stand to increased surface runoff during heavy monsoon rain and increased erosion. Second, high summer rainfall and temperature are conducive to weed growth. In such case thinning should be done in pre monsoon period.

- ▶ No fertility point indicator should apply to less favored lands;
- ▶ The most important areas for establishment of new forests should be low capability sandy or eroded lands, where afforestation should not be restricted with the criterion of the land fertility point.
- ▶ Afforestation should be done in not used abandoned areas, on wastelands.
- ▶ Biological diversity should be taken into account during the afforestation planning process; in respect to biological diversity afforestation plays two important roles. Inadequately selected afforestation areas could destroy the eco-systems and biotopes of marshes, natural and semi-natural meadows, sandy soils and other entities valuable in respect to biological diversity. And on the contrary, adequately pointed out afforestation areas can preserve and enrich the existing biological diversity. New forests linking the existing biotopes would establish migration corridors for fauna and flora among the existing habitats.
- ▶ Preservation of the surroundings around water bodies should be taken into account because the protection of water bodies is a pressing issue in Forests. However, afforestation around water bodies also cuts both ways. Open lakes create picturesque and aesthetically attractive spaces in

the landscape. Water bodies overgrown with trees are not attractive. Besides, trees planted close to lakes start contributing to contamination and ruin hydrodynamic conditions; organic materials start accumulating and lakes tend to become silty and old at a higher pace. On the other hand, forests around water bodies prevent the inflow of surface and soil flow waters from adjacent fields; they also reinforce steep slopes and protect them against erosion.

- ▶ The scenic value of the landscape should be taken into consideration, particularly in Kaghan Naran areas. When planning afforestation, it is necessary to take account of the visual scenic landscape function. Forest may shelter beautiful countryside panoramas, distort landscape elements and decrease the landscape value. New forests should contribute to the establishment of the landscape valuable in its scenery and to isolate the buildings, technical facilities, dumps and cleaning equipment deteriorating the surroundings.
- ▶ Afforestation within the visual cultural heritage protection zone depends on the observation area around the entity. In order to establish harmonious landscape, it is necessary to take account of the dislocation of cultural heritage entities. Afforestation would have an adverse effect on the surroundings of immovable cultural properties and to their natural sight. In other cases afforestation may cover the entities nearby spoiling the view of the cultural property.

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 8 of 10
-----	-------------------	--------------------------	----------------------------

- ▶ In case of the attempt to increase the recreational value of the area, afforestation is wanted close to towns, settlements and water bodies then selection of afforestation areas should also take into account draining systems. Afforestation is forbidden in drained areas or it must be coordinated with land reclamation authorities. When these systems are transferred to the disposal of owners in future, afforestation could be possible in such drained areas, provided the neighboring owners approve of it. Spontaneous afforestation has already started in many places. Such areas should be identified during the detailed state land registration. It is expedient to improve the species composition of forests in the areas excluded from the lists of land reclamation area after their spontaneous afforestation.
- ▶ More forests should be established within the frontier zone and in other more scarcely populated neighborhoods.
- ▶ The goal-specific determinants are the ones that decide whether or not a particular aim or objective of the programme is going to be fulfilled with a particular species. For example, Goal is production of fodder as the goal. To fulfil this goal one must select species, which have fodder value. Species that are not palatable, do not produce significant leaf fodder, or are poisonous, will not meet this criterion.
- ▶ Once a plantation has been established, the work should not be considered finished. In the first years after the planting (while the trees are not developed enough) it will be necessary, for example, to protect the plantation against weather, fire, insects, fungi, unwanted species of weeds and animals
- ▶ The occurrence of damaging weather phenomena is usually unpredictable. Little can be done to protect forest plantations against the damage caused by weather, except to grow tree species known to be resistant to the detrimental effects of local weather patterns, or locating the stands of trees in sheltered areas.
- ▶ Some tree species are more wind firm than others, or are less prone to crowns and branches breaking off in high winds. Other species are more tolerant to salt spray and, therefore, can be used for planting in belts along exposed seaward flanks to give protection to other less tolerant species forming the main plantation. Thin-barked species are more susceptible to damage and to subsequent attacks by insects or fungi than are other species.
- ▶ Fires can originate from natural causes, such as lightning, but many occur as a result of the activities of man. Plantation fires can start from fires spreading from farmland on the perimeter, from the activities of hunters or from burning by herdsman to improve livestock grazing. There have been instances of deliberate burning to create employment (in the fire suppression and subsequent replanting) or to show disapproval of forest policies.
- ▶ It is not possible to prevent a climatic build-up of fire hazard conditions, but much can be done to minimize the risk of fire through public education and involving local people in forestry. A main principle in protecting forest plantations

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 9 of 10
-----	-------------------	--------------------------	----------------------------

against fire is that, where there is insufficient combustible material to allow a ground fire to develop, there is little or no fire risk. Dangerous and damaging plantation fires can only develop when fire is able to occur at ground level.

- ▶ Most insects and fungi are selective of the host species. In their natural environment, trees normally attain a state of equilibrium with indigenous pests. However, when exotic trees are planted, exotic pests can also be introduced. Quite often, these exotic pests readily adapt themselves to the conditions of their new habitat. In general, the risk of damage from pests is higher when the plants are physiologically weakened from planting on unsuitable sites, improper site preparation, inefficient planting, adverse climatic conditions or neglect of weeding and other maintenance operations. But even healthy trees are attacked at times. For many insects and fungi, no control measures are available. When this is the case, the best precaution is to plant tree and shrub species or varieties known to be resistant to the pests.
- ▶ The main precautions to be taken in guarding against possible future damage from insects and fungi are to plant tree species that are suitable to the climatic and soil conditions of the site. Also make surveys of native pests to ensure that none are among the known forms to which the selected species are susceptible. But this is seldom easy, especially in view of the gaps in available knowledge on site requirements and susceptibility of exotic species to insects and fungi. To obtain this needed information, carefully controlled experiments should be initiated before developing large-scale planting programs.
- ▶ Care taken in establishment and maintenance operations during the early years of a plantation (resulting in healthy vigorous young trees) can help to make a plantation more resistant to insects and fungi. However, when evidence of pest attack appears, it should be investigated promptly and the cause identified. Various control measures are available. These may be silvicultural, chemical, biological, or mechanical.
- ▶ Insects and fungi can often be checked by applications of appropriate chemical insecticides or fungicides. Only previously tested and environmentally sound insecticides and fungicides should be prescribed for use. Biological control of insects has been employed with success in some situations
- ▶ In general, there are three orders of wild animals responsible for damage: rodents (rats, mice, moles and squirrels), lagomorphs (hares and rabbits) and artiodactyls (deer, antelopes, pigs and buffaloes). The principal methods of controlling damage by wild animals involve the use of fences, hedges or ditches, trapping and removal.
- ▶ Extensive enclosures of forest plantations can impose drastic changes in the habits and economies of the rural communities affected. In such situations, it would be unwise to initiate planting programs unless alternative means of livelihood can be provided beforehand.

Environmentally Sound Plantation

No:	Version: B	Date: 21 May 2004	Page 10 of 10
-----	-------------------	--------------------------	-----------------------------

- ▶ Culture operations are required to promote the conditions that are favorable to the survival and subsequent growth and yield of the trees in the plantation. In most forest plantations, cultural operations are concerned with preventing the trees from being suppressed by competing vegetation. Quite often, this treatment is called weeding. Other cultural treatments are thinning to achieve a desired spacing among the trees.
- ▶ In spite of monoculture, one should prefer mixed culture in order to avoid failure of species and prevention against diseases.
- ▶ In hilly tracts, there should be a ratio of 60:40 for conifers and broadleaved species.
- ▶ Digging of pits in the field and supply of nursery stock should be simultaneous.
- ▶ One should always take care of pruning to get good quality wood.
- ▶ Field nurseries should be formed where planting is in progress.
- ▶ If planting is done by, cutting then cutting should be soaked in water in the planting area one day before planting.
- ▶ *Robinea pseudocasia* specie should be preferred in hilly tract to control erosion.