## CHAPTER-5

## PAST SYSTEMS OF MANAGEMENT

According to Mr. Yar Mohammad Khan (1984), the forests of Swat Kohistan (Bahrain Tehsil) were exploited for the first time in early seventies of the last century by Kaka Khel Mians of Nowshera. During that period all good large size deodar trees were indiscriminately felled in easily accessible areas especially along the river.

##  Early History

Mr. Parnel, I.F.S Special Conservator of Forests, visited the area in 1927 and prepared a working scheme for exploitation of deodar forests till the preparation of a regular working plan. According to the scheme form 1928 to 1930, 1200 trees of 36” DBH and above were marked in selection felling and 1112 trees were removed in improvement felling (Khan.Y.M, 1984).

## Management Prior to 1950

The first regular working plan for Swat Kohistan was prepared by Malik Allah Yar Khan E.A.C.F. for the period 1931 to 1950. The forests were divided into selection and protection working circles. The selection working circle included two felling series, i.e. export felling series (prescribed yield: 1200 deodar trees of 24” DBH and above) and local felling series (prescribed yield: 300 trees). The system of management was modified selection system which included thinning cum improvement felling. The working plan was extended for another cycle in 1951. On average 450,000 cft, was felled during 1933 to 1963 (Khan.Y.M, 1984)

## Management between 1965 and 1980

In 1960, a new working plan was prepared for a period of 15 years (1965 to 1980) by Mr. M.A Qadeer Khan. The exploitable diameter for commercial forests was fixed as 28” DBH and above. Annually 724,000 cft was prescribed out of which one third was reserved for meeting the requirement of local population. In the plan detailed marking rules, method of executing felling and sequence of felling were laid down. The plan was implemented only for the tree felling prescriptions while other silviculture aspects of the management were disregarded (Khan.Y.M, 1984).

During 1974 the government of Khyber Pakhtunkhwa banned the exploitation of forests through contractors and created Khyber Pakhtunkhwa Forest Development Corporation (FDC) for timber harvesting and other developmental works in these forests. The FDC has started functioning since July 1977.

##  Management between 1984 and 1994

In 1984 a new working plan was prepared by Mr. Yar Mohammad Khan and Mr. Mohammad Ikram for the period of 1984 to 1994 which was assisted by FAO/UNDP. This working plan was prepared for Swat, Matta and Bahrain ranges. The working plan is based on a regional forest inventory method, the entire commercial forest area comprising of 48012 hectares was stratified into three ranges for collection of the required field data. The whole Bahrain range was taken as one stratum for calculating compartment wise yield and the inventory data was collected irrespective of compartments.

The plan proposed two management alternatives; the first alternative encompassed an intensive and integrated development program including agriculture etc. while the second alternative was a traditional system of forest management

**Alternative-I**

The first alternative envisages a developmental program for planning, managing and utilizing forest resources through an intensive forest management working circle and integrated development working circles. The pre requisite of the first alternative is the availability of proper funds.

**Objectives**

The main objectives were:

* To maintain and further develop the forest cover in order to get maximum sustainable annual yield, to preserve watershed protection function, erosion control, to regulate water supply, preserve wildlife habitats, enhance the scenic beauty and develop environmental setting.
* To delineate forests and other land resources within their boundaries through a cautiously organized program of settlement and land use classification.
* Using forests and other available land resources within the protected forests boundaries to the best advantages through the techniques of integrated land resources management planning and development.
* Ensuring basic necessities for all, such as water, timber, firewood and fodder for animals but at the same time to protect the forests from the hazards of increased population pressure.
* Accelerating the pace of development of these backward areas which are endowed with natural resources like forests, minerals, water, wildlife, fish, medicinal herbs and natural scenic beauty etc. through proper investments.
* Increasing import substitution and export earnings.
* Increasing per capita income through installation of wood based industries in the areas and utilizing other land resources within forest boundary in judicious manner.

##  Working circles

The following working circles were proposed.

## Intensive Management Working Circle:

It consists of productive coniferous forests which are mostly mature and over mature occurring on gentle slopes and are considered under present circumstances suitable for management on intensive basis. The locals will have to execute a bond for a period of ten years not to use the area for grazing and they will not exercise concessions on timber, firewood, grass cutting and grazing in such areas. Under this working circle a separate timber harvesting program has been prescribed.

## Selection Working Circle:

This working circle consisted of all productive coniferous stands growing on steep slopes which cannot be allotted to intensive management working circle due to their physiographic, biotic and other ecological conditions.

## Integrated Development Working Circle:

This working circle consisted of compartments which are poorly stocked, having considerable blanks, erosion areas and where regeneration is deficient. Under this working circle an integrated development plan will be prepared through coordinated efforts of concerned agencies and a lot of extension efforts will have to be made to educate the staff and rural masses about the approaches of multiple resource management models.

**Alternative-II**

This alternative presented the traditional system of management emphasizing selection system with natural regeneration aided by artificial regeneration in existing blanks and then affording proper protection to all such forests.

**Objectives**

The principal objectives were:

1. To preserve and improve the forests to the optimum level.
2. To maintain and further develop the forest cover in order to preserve the watershed protection function, erosion control and soil conservation in order to regulate water supply and to develop wildlife habitat, preserve the scenic beauty and natural environment.
3. To manage parts of the forests suitable for commercial exploitation to obtain long term timber production at highest sustainable level.
4. To protect the forests from hazards of increase population pressure but at the same time to satisfy the demand of timber, firewood and fodder of the local people.

##  Working circles

The following working circles were suggested.

## Selection Working Circle:

This working circle included all the productive coniferous forests. The crop in this working circle is of irregular nature and is mature and over mature with dense patches of regeneration at places, requiring tending and proper exploitation.

## Improvement Working Circle:

This working circle included all the remaining areas not included in selection working circle.

## Achievements of the plan

It would have been a major break through for the development of forests if alternative-1 of the previous working plan had been implemented properly. It could not be implemented due to lack of financial resources, traditional thinking of foresters and local people, which needed proper extension facility. However, the alternative-11 was implemented only to the extent of felling program proscribed in the selection working circle.

##  Marking

The forests mentioned in table:5 have so far been marked against the working plan prescription from 1984 to 1992. In some of the forests the harvesting is yet to be completed therefore, the harvested volume is lower than the marked volume. In Chel and Beshigram blocks the marked volume is higher than the prescribed volume because in the previous working plan the yield was calculated on regional basis and the yield for Swat and Matta ranges was lower than Bahrain range. As Chell and Beshigram blocks were included in Swat range therefore, the yield calculated for the whole range was applied to these blocks irrespective of their crop condition which has resulted into more marking than the prescribed volume. Moreover, in Tirat block the harvested volume is quite lower than the marked volume because of local disputes and court cases.

**Table: 5(A) The block wise prescribed, marked and harvested volume of timber from 2003-04 to 2012-13**

|  |  |  |  |
| --- | --- | --- | --- |
| Block | Prescribed volume (Cft) | Marked volume (Cft) | Harvested volume (Cft) |
| Chell | 62650 | 371777 | 287438 |
| Beshigram  | 249920 | 924116 | 678512 |
| Tirat | 402283 | 289675 | 541 |
| Bahrain | 245770 | 296947 | 288722 |
| Gurnai | 1269576 | 905693 | 587168 |
| Ramet | 584815 | 419015 | 72631 |
| Mankial | 787605 | 558147 | 544213 |
| Balakot | 466570 | 352686 | 179152 |
| Torwal | 598314 | 705597 | 413228 |
| Daral | 517896 | 549886 | 266810 |
| Total  | 5186399 | 5373539 | 3273415 |

##  Revenue and expenditure

According to the available record the major sources of revenue is the sale of timber through FDC and forest duty. The expenditure is mostly related to pay and allowances of the staff and developmental activities like nurseries and afforestation.

 **Revenue and expenditure of last (10 Years)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Revenue target** | **Achievement** | **Expenditure** |
| 2003-04 | 23263000 | 18308486 | 4780608 |
| 2004-05 | 22980000 | 18446175 | 5568968 |
| 2005-06 | 34961000 | 30642351 | 6807959 |
| 2006-07 | 33650000 | 26813419 | 8948658 |
| 2007-08 | 19185000 | 19244269 | 10294389 |
| 2008-09 | 28820000 | 17556080 | 12991214 |
| 2009-10 | 17663000 | 22109893 | 15159706 |
| 2010-11 | 20210000 | 20213209 | 20666531 |
| 2011-12 | 35995000 | 39648217 | 23595240 |
| 2012-13 | 31675000 | 33633816 | 28243322 |
| 2013-14 | 31675000 | 16516875 | 26989498 |

##  Management between 1994 and 2008

During 1993-94 to 2007-08 was prepared by Mr. Haider Ali Khan for a period of 14 years. This management plan covers the forests of Swat Kohistan situated in Bahrain Tehsil of Swat District, which is the part of newly created Kalam Forest Division. Previously these areas were included in Swat Forest Division. This change was agreed in response to a request made by Kalam Integrated Development Project which intended to bring Bahrain Tehsil also in to the orbit of its activities from 1992. This management plan fits in to their policies regarding integrated and participatory approach to the management and development of natural resources. The main features of the management plan were as under:

* Management has been brought down to the stand level instead of compartments. In this way, the plan looks at the compartments as a unit of management and stand as a unit of treatment.
* Apart from the traditional working circles, namely selection and improvement, a new circle called multiple-use working circle was added. The idea was to cater for the management and development of natural resources outside the boundaries of protected forests.
* Planning process of the plan used quite thoroughly the participation of the local communities and agencies like FDC and others.
* A new section to the operative chapters was added which outline which outline the strategy for implementation. It was made mandatory to enlist the cooperation of local communities for protection, regeneration and control of grazing etc. so as to ensure sustainability.
* Separate chapters were added in the plan, on afforestation, wildlife management and opening-up scheme due to their importance.

Besides the selection and improvement working circle, the objectives of management of newly introduced multiple working circle were fixed as under:

1. To integrate developmental activities on private and community lands with the development of natural forests.
2. To develop better understanding between the local people and forestry staff.
3. To involve the local communities in developmental activities through effective extension program with a view to enlist their support for protection, utilization and regeneration of the forests.
4. To promote alternative sources of energy and fodder by introducing fast growing tree species to meet the demand of local people for firewood and fodder.
5. To improve the existing land-use practices for the rehabilitation of environment by various operations suitable the site.
6. To improve the habitat and ecological conditions so as to provide shelter to the wildlife.

As there was ban imposed by the Govt. on commercial harvesting during the plan period, only dead dry windfall were extracted during the period under dry wind fall policies, the detail is given in appendix -10.

## CHAPTER-6

## FOREST INVETORY AND DATA ANALYSIS

## General

Generally, lower slopes in the plan area, near valley bottoms and settlements, are very steep and covered with oak forests while the well-stocked and productive conifer forests are located on gentle slopes at higher elevations. In most cases, it requires a few hours tiring walk on steep and inaccessible terrain just to reach to the bottom of compartments. The compartments usually consist of stands of well-stocked forests of varying extent on gentle slopes frequently broken by steep cliffs. Depleted stands are commonly met with along settlements on lower side and steep areas of compartments. So far paths have not been constructed inside forests and it is, therefore, impossible to traverse the whole area of compartments along grid lines. It was therefore decided to make forest inventory only in well-stocked and accessible parts of compartments.

## 6.2 Forest Inventory Procedure

The following forest inventory procedure was adopted:

1. Forest inventory was conducted in all of the forest compartments. The mapping for species and stocking condition was done for all the compartments.
2. Grids were laid in all compartments for location of the plots;
3. Sample plots were laid out at 300 X 300 meters which gives intensity of sampling of one plot per 9 ha. At least 10 sample plots were taken in each compartment.
4. In non-forests area the strip of sample plots were laid out at 200 X 200 meters which gives intensity of sampling of one plot per 4 ha.
5. To start inventory in compartment, inventory team entered the compartment from a known boundary/landmark, which was duly located on map. The bearing and distance from the sample plot from the landmark were measured on map with the help of a protractor and scale (cm) and then converted to distance in meters on ground. As the bearing on ground was measured with compass, always one degree was added to the map bearing (magnetic bearing is one degree less than grid bearing).
6. Slope correction was made for measurements on sloppy grounds by using the slope correction tables.
7. After the sample plot had been located, data was recorded on the Forest Inventory Form in the sequence given in the form as under:
* Forest, compartment and plot information
* Terrain characteristics
* Stand characteristics
* Regeneration characteristics
* Pressure of social uses
* Biodiversity status
1. Relascope was used for finding in-trees on each plot, with basal area factor depending on the density and age class of forests. Data on each in-tree was recorded for species, dbh, tree class, tree form, lopping damage, causes of bole damage and severity of bole damage.

## Data Analysis

All inventory plots are variable radius plots established with Rela-scope. This type of inventory plot achieves a more uniform coverage of diameter classes than a fixed area plot. It also avoids the complication of concentric plots with different radii for different diameter classes, and is therefore, easier and faster to establish in field. In addition, the Relascope provides automatic correction of plot size for slope, which avoids the need for slope tables when laying out the plots.

As in case of Relascope, plot size is not a fixed area but varies with both tree size and basal area factor. Special formulas are therefore required:

Basal area per ha = Fn, where

 F = Basal area factor in sqm/ha

 n =Number of tallied trees

Number of trees/ha represented by each tree = F/B, where

 F = Basal area factor in sqm/ha

 B =Tree basal area in sqm

Volume per ha = VF/B, where

 V = Tree volume in cum/ha

 F = Basal area factor in sqm/ha

 B =Tree basal area in sqm

### Volume Tables

The PFI Volume tables (Ahmad and Hussain, 1975) were used for computation of volume of conifer species in (appendix **-**5)**.**

### Increment models

The conventional method of increment cores extraction from sample trees and measurements of increment cores in field and computing averages of cores for each diameter class has serious limitations. Identification of annual rings with naked eyes is subjected to errors and further use of simple averages of cores for diameter classes is not advisable due to the fact that there is no direct relationship between diameter and increment cores in selection forests. Therefore, the increment models developed by Mr. Yar Muhammad Khan and Mr. Muhammad Ikram have been used for estimation of increment of blue pine, deodar, fir and spruce of the plan area. The growth data was collected on technical lines for the entire forest area and serve the purpose for this plan. The annual growth per hectare for all species in Bahrain Tehsil is given below:

Table-6(A) Models used for estimation of increment

**Annual growth per hectare (M3}**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Area** | **Deodar** | **Kail** | **Fir** | **Spruce** | **Total** |
| Bahrain Tehsil | 0.833 | 0.698 | 1.148 | 1.009 | 3.688 |

### Analysis of area

Based on the area statement given in appendix-I**,** the analysis of the area is shown in the table below:

Table-6(B) Analysis of the area (ha)

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Net Stocked area** | **Blank area** | **Gross area** |
| **Poor Stocked Forests** | 10176 | 4469 | 15333 |
| **Well Stocked Forests** | 5875 | 988 | 6186 |
| **Total** | **16051** | **5457** | **21519** |

The table indicates that blanks cover substantial area of 5457 ha mostly occurring near habitations and alpine pastures or on steep and rocky areas. Blank areas, where accessible, are used for grazing. Poor stocked forests are not fit for commercial harvesting due to low density and steep and rocky terrain. These forests are also grazed heavily by animals which hampers natural regeneration. Most of the blanks and poor stocked forests are confined to improvement working circle. The well-stocked forests over an area of 5875 ha are met with in commercial and biodiversity working circles.

### Occurrence of tree species

The tree species sampled during inventory consisted of conifer and broadleaved species as under:

Table-6(C) Occurrence of tree species

|  |  |  |  |
| --- | --- | --- | --- |
| **SPECIES** | **NO OF TREES** | **TOTAL VOL(M3)** | **Tree %age** |
| KAIL | 549721 | 938881.87 | 16 |
| DEODAR | 1224590 | 1664432.96 | 36 |
| FIR | 811595 | 1594636.91 | 24 |
| SPRUCE | 802611 | 1583678.06 | 24 |
| **G.TOTAL** | **3388517** | **5781629.80** | **100** |

The species representation by tree number is Deodar, Spruce, Fir and Blue Pine by 36%, 24%, 24% and 16% respectively. The volume share for species is, Deodar, Fir, Spruce and Blue Pine by 29%, 28%, 27% and 16% respectively.

### Species wise stand cum stock table

Calculations for stand cum stocking have been made for conifer tree species only. The abstract results of forest inventory carried out in 145 compartments over an stock area of 16051 ha is given below:

Table-6(D) Number of Trees and Volume by species

|  |  |  |
| --- | --- | --- |
| **SPECIES** | **NO OF TREES** | **TOTAL VOL(M3)** |
| KAIL | 549721 | 938881.87 |
| DEODAR | 1224590 | 1664432.96 |
| FIR | 811595 | 1594636.91 |
| SPRUCE | 802611 | 1583678.06 |
| **G.TOTAL** | **3388517** | **5781629.80** |

From the table it is evident that Deodar represents major position in term of volume of the crop composition (29%). The species followed by Deodar is the Fir/Spruce, which is 24% and 24% respectively of the total crop. Blue Pine represents 16% of the crop composition.

The growing stock per hectare comes to 360.20 ha. The per hectare stocking of the expired plan was 496.09 cum/ha. Thus a depletion of 27% has occurred in stocking of forests from 2007-8 to 2014-15.

### Development phases

An analysis of development phases of forests was made to get an idea about the age distribution of various tree species.

Table-6(E) Development phases of tree species (% trees)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | **Immature Trees** | **Sub-Mature Trees** | **Mature Trees** | **Over Mature Trees** | **Total Trees** |
| Kail | 2 | 72 | 20 | 6 | 100 |
| Deodar | 4 | 72 | 18 | 6 | 100 |
| Fir | 1 | 65 | 25 | 9 | 100 |
| Spruce | 2 | 67 | 21 | 10 | 100 |
| Total | **3** | **69** | **21** | **7** | **100** |

**Immature (< 20 cm dbh), Sub-mature (21-50 cm dbh), Mature (51-70 cm dbh), Over mature (70 + cm dbh).**

The above figures give clear indication about the imbalanced size distribution of trees and unless the forests get properly regenerated, the concept of sustained yield is no more relevant to such forests.