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***Proposal for a 5-Level Planning Approach for the  
Management of Forest Management Units  
on Commercial Basis***

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Report on several  
short term consultancies  
on

## **FOREST RESOURCES MANAGEMENT**

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## **1 Preface**

This paper has been prepared to briefly explain and justify the concept for a 5-level planning approach in forest resources management planning. This concept refers only to the identification and management of self-sustainable<sup>1</sup> Forest Management Units with the objective of commercial timber production and has been designed in order to increase the efficiency and effectiveness of the present management planning system. It does not deal with the management of forests outside FMU's. For those - except for the establishment of community forests - no management concepts exist so far.

This paper outlines the planning approach. For some of the individual planning steps guidelines have already been prepared. Additionally, a Forest Management Planning Code for Bhutan is currently under preparation which will compile and describe in detail the individual planning procedures from data gathering, analysis, planning, mapping, to plan preparation and it will furthermore include silvicultural guidelines and prescriptions for plan implementation.

## **2 Short Description of Present Forest Management Planning System**

The present planning systems is more or less based on three levels: reconnaissance inspection, forest management planning and operational planning. The identification of potential FMU areas has usually been (except for East Bhutan, see LAUMANS, 1995) based on recommendations obtained from dzongkhags (district officers, etc.). The FRDS then sends a team composed of a management planning specialist, DFO and field staff to the respective area which carries out some field inspection which includes the measurement of random samples and a rough assessment of inaccessible areas. Based on this rather "subjective" assessment the decision is taken to open a FMU or not. Once it is decided to open a FMU, a forest management inventory is implemented and the forest area is mapped according to forest type and land use based on aerial photo interpretation and field truthing. Basically based on this information and on field checking by the respective management planner the forest management plan is prepared which provides quite reliable information for the FMU as a whole. However, as the management plan does neither provide precise information on particular forest areas (i.e. stands, subcompartments) nor does it include spatial and timely planning, it makes it necessary, that during the course of operational planning operational inventories have to be carried out which is done by the territorial staff of the respective DFO. The whole planning system is focused on commercial timber production. Ecological and social aspects are

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<sup>1</sup> self-sustainable in this context means, that the FMU is managed in such a way that it will produce continuously an approximately same amount of timber

incorporated in the plan in a more or less descriptive way and it is up to the implementors (DFO and FDC) to take adequate action. The local people are so far not included in the management planning process.

### **3 Justification and Limitations of the Proposed Planning System**

The proposed planning system consists out of 5 planning levels (steps) which are shown in the figure 1.

The reasons for the development of the proposed 5-level planning approach were the following:

- to get a more realistic information on potentially suitable areas for the establishment of self-sustainable FMUs for commercial timber production;
- to include social and environmental aspects in the decision process on FMU selection;
- to check the economic feasibility of commercial timber production based on realistic stand data (reconnaissance forest inventory) before the decision is made to open FMU;
- to involve the local population in land use planning and to integrate forest resources planning into RNR-management;
- to identify the environmental and social functions of the forest together with the local population and to define management prescriptions for the different functions;
- to gather more specific and spatial information on the forest condition for those areas which should be managed within the planning period of the management plan (detailed mangement forest inventory);
- to reduce the efforts for inventory field work by introducing relascope sampling and the use of GPS;
- to define the stand as the unit for planning, monitoring and evaluation (standwise planning) in order to allow qualitative assessment and the monitoring of growth dynamics;
- to close the gap between planning and implementation by prescribing the activities to be implemented within the planning period in detail in the Stand Book;
- to increase reliability of yield regulation by considering the development stages of the different forest types, the prescribed silvicultural systems and the production status in AAC calculation;
- to minimize efforts for operational planning (no inventory).

Figure 1

The proposed new planning approach is based on the following considerations:

#### Cost Effectiveness

The cost and time requirements for the whole planning process should not exceed those of the old system.

#### Human Resources Capacity

The proposed planning procedures should be adapted to the present human capacity. Training needs should be kept minor and to be dealt with in service.

#### Equipment and Infrastructure

The proposed planning procedure should be implementable with the already available equipment and infrastructure of FRDS.

#### Test and Check on Feasibility

Before introducing the proposed planning scheme it should be tested and checked on effectiveness and feasibility on a pilot area (ie. Gogona).

#### Flexibility

The new planning procedure should allow a stepwise introduction as well as a continuous further development based on new experiences and innovations.

The introduction of a Forest Resource Potential Assessment on dzongkhag level allows a more objective identification and preselection of potential FMU's taking into consideration the overall forest resource condition and the local domestic and commercial demand on wood products. The FRPA is mainly based on GIS-analysis of already existing information, namely LUPP Land use data and forest inventory data and does not require any additional field work. The advantage of the FRPA is, that subjective and biased criterias are eliminated from the identification process of FMUs which saves unnecessary time consuming and costly field investigations.

The decision whether a FMU will be opened or not will be subject to a more detailed and objective Reconnaissance Survey. It is probably the largest advantage of the proposed forest resources planning concept that it is already checked on reconnaissance level whether forest management in a particular area would be:

- sustainable in the long run,
- economically sound,
- and environmentally and socially acceptable.

This information is obtained at present during the course of management planning. At this stage already a lot of human and financial resources have been invested (implementation of detailed inventory, aerial photo interpretation, field truthing, etc.) and it is very unlikely that finally the decision is made that it is either not worthwhile or not acceptable to open a particular area as a FMU. Thus by introducing the new concept a realistic decision could be made at an earlier stage with a minimum on human and financial input.

Among others, the RS is based on a Reconnaissance Forest Inventory (RFI) which is designed in such a way that within a short period of time a sufficiently precise estimate on the overall forest condition will be available. The results of the RFI would furthermore enable a much more detailed forest management planning which will be briefly explained in the following:

It is the policy of the Forest Department to manage a FMU permanently, which means more or less that the annual allowable cut (AAC) within a FMU should always be at about the same level (i.e. in future planning periods). This implies of course, that yield regulation is based on harvestable standing stock, cutting cycle and area. Now, when a new forest area is taken under management, forest exploitation will only be carried out in a part of the area while the others remain untouched. (Remark: In Bhutan still most of the forest areas are natural forests of high stability. Thus, from the ecological point of view, there is no immediate need for silvicultural intervention.)

Depending on the silvicultural system (i.e. selective cutting, clear felling, etc.) and the harvesting technique applied (i.e. cable crane logging) the area of intervention within a 20 years planning period varies between 20 - 40% of the total area. It does not make sense to carry out intensive field inventories in areas which are not subject of intervention within the planning period. To intensify field investigation and to concentrate on those areas which should be managed within the planning period (preferably mature and overmature stands), stand description, planning, monitoring and evaluation can be based on much smaller units such as stands or, at least, subcompartments. This allows a more realistic calculation of the AAC (to be based on individual silvicultural planning) and improves sustainability in the long run. With the introduction of such a gradual management planning procedure a more precise and detailed planning is possible with almost the same amount of human and financial input.

The RFI will provide the required information. The estimate on the standing stock, increment and area distribution of different forest strata (results of RFI) allows the calculation of a preliminary sustainable AAC. With the information on forest type and condition and on terrain features, the potential silvicultural systems and harvesting methods can be identified. Based on this, the area demand for the subsequent forest management planning period can be estimated and the areas of intervention can be preselected. For the final selection detailed aerial photo

interpretation and field truthing will be necessary. Finally, the knowledge on the CV% of the different forest strata will allow a more precise planning of the forest management inventory.

The results of the RFI, among others such as topographic and infrastructural information, enables the planner to roughly assess the economic feasibility of commercial timber production (Economic Feasibility Study EFS). The implementation of a RRA will provide information on the social acceptance and impact of future management (Socio-Economic Study SES) and the ecological impacts can be predicted on the basis of an Preliminary Environmental Examination (PEE). The results and recommendations of these components of the RS allow the decision makers to base the decision whether to open the area as a FMU or not on objective economic, ecological and social sustainability criteria.

Before the actual management planning process starts, the area to be covered by the management plan and the respective functions of the forests will be defined in a participatory way. Based on the function, the areas suitable for commercial logging, areas to be set aside for local use and protected areas will be identified. In contrast to the old system, the ecological and social functions of the forest will be localized which allows the determination of management restrictions for particular areas. The Forest Function Map will be an important tool for the FMU incharge for coup identification and tree marking.

By introducing the above mentioned 3 planning levels before implenting forest management planning, it is possible to prepare much more detailed and comprehensive management plans which provide information and planning on stand level by implementing a detailed management inventory only in the area of intervention within the planning period (excluding protected areas). This allows standwise monitoring and evaluation and a more precise determination of the AAC. In addition, the extension of the planning period from 10 to 20 years will help to reduce the work load for the management planner of FRDS. Furthermore, operational planning will be considerably facilitated, as there is no more need for the implementation of operational inventories, as required data can be directly derived from the Stand Book.

It has to be mentioned that the first three planning levels i.e. the Forest Resources Potential Assessment, the Reconnaissance Survey and the participatory Land Use and Forest Function Planning and Mapping have only to be carried out once. The Forest Function Map will, however, be updated during the course of standwise planning every 20 years, when a new management plan is being elaborated.

#### **4 Brief Description of Planning Levels**

In the following only a brief description of the individual planning levels is provided. As already mentioned, for some components (i.e. FRPA, RFI, FFM) already some draft guidelines were

elaborated. The Forest Management Planning Code for Bhutan, which is under preparation right now, will finally contain comprehensive descriptions and guidelines for all the individual components of the planning procedures including implementation guidelines.

#### **4.1 Forest Resource Potential Assessment (FRPA)**

It is the objective of the FRPA to identify on a macroplanning level all forest areas which have a potential for future forest management, in particular, it should identify forest areas which might be suited to be managed as FMUs in future. It furthermore has to provide statistics on forest type distribution and estimates on standing volume and increment on dzongkhag-, gewog- and on potential FMU-level and contain a wood production/demand scenario. A FRPA should be carried out at least on dzongkhag-level. As already proposed (and carried out for the Districts of Punakha and Wangdue) the FRPA should be a result of a GIS-based analysis combining LUPP land use data and stand information derived from various inventories (SCHINDELE, 1995 a, b). Details of the planning procedure are shown in figure 2.

#### **4.2 Reconnaissance Survey (RS)**

The Reconnaissance Survey should contain a more detailed assessment of a particular forest area which has been defined as a potential FMU during the FRPA. It should provide all the necessary information required to enable decision makers to decide whether a potential forest area should be managed as a FMU or not. In particular, the Reconnaissance Survey should consist out of the following three components:

- *Socio-Economic Study (SES)*
- *Economic Feasibility Study (EFS)*
- *Preliminary Environmental Examination (PEE)*

Figure 2

Figure 3

The Socio-Economic Study (SES) is based on a Rapid Rural Assessment (RRA). Beside key social data information on local resource use should be collected. The most important result, however, is to identify whether there is any social opposition, perception or constraint which might affect commercial forest management. If there is a very strong opposition against forest management, this should be investigated thoroughly and if necessary, the planning process should stop and the area should not be further considered as a potential FMU.

The Preliminary Environmental Examination (PEE) can be based on the information obtained from the SES and the RFI and it should evaluate the suitability of the concerned area for commercial forest management from the environmental point of view.

The Economic Feasibility Study (EFS) is the last step to be implemented. It should evaluate the suitability of the concerned area for commercial forest management from the economic point of view. The implementation of a Reconnaissance Forest Inventory (RFI) provides the most essential information for the economic analysis: an estimate of the potential annual allowable cut (AAC) and defines the priority areas for management.

The results of each study or component will be described in individual reports. The responsible management planner will compile the results in the reconnaissance survey report and discuss the pros and cons for the opening of a FMU. It is finally up to the decision makers to decide, whether a FMU should be opened or not.

Details of the planning procedure are shown in figure 3.

#### **4.3 Land Use and Forest Function Planning (LUFFP)**

Once the decision has been taken to open a FMU a participatory land use and forest function planning should be implemented in order to jointly decide with the local population, the district administration and the FSD on the future land use distribution (Land Use Plan). The most important result will be the determination of the permanent forest area. Then, within the permanent forest area, the forest functions should be defined and mapped (Forest Function Map) and the relevant management prescriptions/restrictions should be determined (see SCHINDELE and DHITAL, 1997). Based on the results of the forest function map the total area available for commercial forest management will be known (Production and Limited Production forest). Also, the forest areas to be set aside for the exclusive use of the local population (Local Use Only) and the areas which should be totally excluded (Protection) from commercial timber exploitation will be defined. Details of the planning procedure are shown in figure 4.

Figure 4

Figure 5

#### 4.4 Forest Management Planning (FMPL)

Based on the information from the Land Use Plan and Forest Function Map two separate Forest Management Plans should be elaborated: one for the commercial timber production (commercial FMU) and one for the Local Use Only areas (Social Forest). The planning period for both plans should be 20 years. An important planning tool for the management planner is the Forest Management Map which shows the distribution of the different forest types (result of aerial photo interpretation) and their development stages (young, mature, over-mature) and the respective production status of the forest (Protection, Local Use Only, Limited Production, Production).

The Management Plan for the commercial FMU should include all permanent forest areas except the Local Use Only areas. The basic concept of the management planning system is standwise planning (stand in this context is defined as "*a collective of trees having similar characteristics, and having an area larger than a defined minimum, and which shall be subject to the same silvicultural treatment*"). The delineation of the stands and the planned silvicultural activity is shown in the Forest Operation Map. The Stand Book contains a detailed description of the stand, its function and management status and a prescription of the planned silvicultural operation. Monitoring and evaluation is done on stand level, too and implemented activities are recorded in the Stand Book. Standwise planning should only be carried out in those areas which has been identified by the RS as priority areas for forest management (between 20 and 40% of the total production area for the first 20 years planning period). The main activities are:

- the implementation of a Forest Management Inventory (FMI) which is designed in such a way (systematic grid sampling) that information can be derived on stand level;
- delineation of compartments, subcompartments and stands based on the results of aerial photo interpretation and field truthing;
- silvicultural planning in the field.

The calculation of the sustainable AAC is based on the results of the Reconnaissance Forest Inventory and considers the distribution of the forest types and their development stages, the applied silvicultural systems and the distribution of the different production status. Based on this AAC the stands to be managed within the next planning period will be finally determined. Based on the individual silvicultural planning of these stands, the final silvicultural AAC is determined.

Compared to the present system of forest resources planning, the proposed approach would provide more detailed and accurate information on forest management planning level with approximately the same input on financial and human resources.

The Management Plan for the Local Use Only areas should follow the prescriptions in the "Community Forestry Guidelines for Bhutan" and the "Social Forestry Rules".

Details of the planning procedure are shown in figure 5.

#### **4.5 Operational Planning (OP)**

Operational planning should be done periodically every two years by the DFO. The information required for planning can be completely derived from the Stand Book; operational inventories are no longer required.

## **Annexes**

## Annex 1: Literature

- LAUMANS, P.; 1995: Selection of Potential Forest Management Areas in Eastern Bhutan based on GIS Techniques. Third Forestry Development Project, RGOB/MOA/FSD.
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- SCHINDELE, W., DHITAL, D.B.; 1997: Forest Function Planning and Mapping. Guidelines for the Preparation of a Forest Function Map and Definition of Management Restrictions. Working Paper No. 11. BG-SRDP.

## Annex 2: Proposal for a 5-Level Forest Resources Planning in Bhutan

| Planning Type   | Period          | Level              | Objective   | Source of Information  | Analysis  | Documents (Results)   | Time Required | Implementing Units   |
|---|-----------------|--------------------|---|--|---|---|---------------|--|
| <b>FRPA</b><br>Forest Resources Potential Assessment                  | once            | Dzonkhag           | <ul style="list-style-type: none"> <li>Information on Forest Resources Potential</li> <li>Identification of potential FMU-areas</li> </ul>              | <ul style="list-style-type: none"> <li>Lupp land use data</li> <li>DEM's</li> <li>Topographic data</li> </ul>  | purely GIS based  | <ul style="list-style-type: none"> <li>FRPA Report</li> <li>FRPA-Map</li> </ul>   | 2-4 weeks     | <b>FRDS</b><br>GIS-Cell  |
| <b>RS</b><br>Reconnaissance Survey                                    | once            | potential FMU      | <ul style="list-style-type: none"> <li>Decision on FMU opening</li> <li>Identification of priority areas</li> <li>Definition of Objective</li> </ul>    | <ul style="list-style-type: none"> <li>RRA</li> <li>Reconnaissance Forest Inventory (RFI)</li> <li>GIS-Analysis</li> </ul>   | <ul style="list-style-type: none"> <li>Socio-economic Study (SES)</li> <li>Economic Feasibility Study (EFS)</li> <li>Preliminary Environmental Examination (PEE)</li> </ul> | RS-Report   | 2-3 month     | <b>FRDS</b><br>FRI-Unit<br>SFAS<br>EIAD<br>NCS<br>NEC<br>WWF   |
| <b>LUP &amp; FFM</b><br>Land Use Planning and Forest Function Mapping | 20 years update | FMU                | <ul style="list-style-type: none"> <li>Identification of permanent forest areas</li> <li>Definition of functions and management restrictions</li> </ul> | <ul style="list-style-type: none"> <li>PRA</li> <li>EA</li> <li>GIS-Analysis</li> <li>API</li> <li>field truthing</li> </ul>   | <ul style="list-style-type: none"> <li>GIS-Analysis</li> </ul>  | <ul style="list-style-type: none"> <li>Forest Function Map</li> </ul>   | 1 month       | <b>FRDS</b><br>GIS-Cell<br>API-Cell<br>SFES<br>etc.  |
| <b>FMPL</b><br>Forest Management Planning                             | 20 years        | FMU (partial plan) | Definition of management activities (silviculture, infrastructure, community involvement, wildlife management, environment protection, etc.)            | <ul style="list-style-type: none"> <li>Forest Inventory</li> <li>Aerial Photo Interpretation</li> <li>Field Cruising</li> <li>EA Environmental Assessment</li> <li>PRA</li> <li>Additional Surveys</li> <li>FFM</li> </ul> | <ul style="list-style-type: none"> <li>PLOT data analysis</li> <li>GIS analysis</li> <li>accessibility planning</li> <li>standwise planning</li> </ul>                      | <ul style="list-style-type: none"> <li>Forest Management Plan</li> <li>Stand Book</li> <li>Forest Management Map</li> <li>Forest Utilisation Map</li> </ul> | 1 year        | <ul style="list-style-type: none"> <li><b>FRDS</b></li> <li>GIS-Cell</li> <li>Inventory</li> <li>API-Cell</li> <li>DFO</li> <li>BLC</li> <li>others</li> </ul> |
| <b>OP</b><br>Operational Plan   | 2 years         | part of FMU        | Input/output calculation<br>Budget requirements<br>Specification of working areas, etc  |  | <ul style="list-style-type: none"> <li>based on Management Plan (stand data)</li> <li>involvement of BLC</li> </ul>   | Plan of Operation   | 1 month       | <ul style="list-style-type: none"> <li>DFO</li> <li>BLC</li> </ul>   |

EIAD: Environmental Impact Assessment Division

NCS: Nature Conservation Section

NEC: National Environment Commission

SFAS: Social Forestry and Afforestation Section