ULTIMATE FORESTS COMPANY

FORESTRY OPERATIONAL PROCEDURES

1.0. FORESTRY OPERATIONS PROCEDURES

1.1. Forest Planning

Due to the long-term nature of forestry, specific long term planning of the operation is necessary to ensure the sustainability of the resource, and the natural resources found on the forestlands. Ultimate Forests Company limited plans their operations based on:

Rotations of the species and the volume desired, and uses GIS and computerised Forest Management Systems (FMS) to plan and manage the forest and natural resources.

The Forest Management Agreement between them, the Rwanda Forest Authority, and local communities.

There are five levels of forest planning.

1.1.1. Forest Management Agreement

Based on the sustainable off-take over the agreement period and desired product. This is the legally binding document allowing Ultimate Forests Company Limited to log the various land areas in the agreement. This is primarily based on the Rwanda Forestry Authority (RFA) Inventory, national legislation and local community requirements.

1. **Rotation level**: based on the species and desired product. Rotation age shall be optimised taking into account the following:
    1. Maximising yield and land use (matching species to the site / soil)
    2. Mill fibre specifications
    3. The effect of tree size on harvesting costs.
2. **At tactical level**: The Tactical Plan generated annually before the APO is generated and approved by the relevant level in consultation with the

3. planning department, In harvesting tactical plans are used to balance harvesting systems / equipment with prevailing terrain conditions and climate.
4. **At a budget level:** The Annual Plans of Operation **(APO)** shall be completed as part of the budget process, and approved by the Executive Management in consultation with the planning department. The APO also allows for accurate phasing of operations in compartments during the year.
5. **At an operational level**: known as Operational Harvest Plans or an Operational Silvicultural Plans. These shall be completed together, normally with a prescribed compartment map, which must be available in field at all times during the operation. Any changes (including mishaps) to the operation shall be shown on the compartment plan (map). This plan shall be completed and approved by the relevant level of management before operations commence.

1.1.2. Plantation Management Plan

All forest operations are required to prepare and keep updated a Plantation Management Plan (PMP), this can be broken down into two key parts:

1) **A description of the resources found on the management unit**: this would cover natural resources, communities, staffing and infrastructure.
2) **A description of the management of these resources:** where unique aspects may require that these resources should be managed in a unique way while still complying with the company's overall strategies as laid out in this policy manual.

All plans are formalised and only the approved formats should be used, Summaries of the management plan and monitoring results shall be made publically available.

1.2. Forest Research

Ultimate Forests Company Limited conducts research across a number of fields and these include:

1) **Site preparation and planting**: Components that are investigated include size and age of the planting hole, position of the planting hole (sunken, ground level, raised), pre-planting weed control, watering regime and/or hydro gels.
2) **Species choice**: various pine, eucalyptus and indigenous species trials are being undertaken.
3) **Weed control**: Three broad categories of weed control trials exist based on growth stage: pre-planting, establishment and mid-rotation. Three other categories overlap these, based on the method of weed control: manual, mechanical and chemical.
4) **Fertiliser application**: Types of treatments include type of fertilizer (both chemical and physical composition), number of applications and timing of application. The next step in fertilizer trails would be micro-nutrients.
5) **Un-thinned Spacing**: A simple type of experiment to compare growth rates based on the escapements between trees.
6) **Thinning trials**: Thinning trials are often a progression from un-thinned spacing trials. The initial spacing is already decided (this can often be two different spacing's), and then a range of thinning reductions are applied at various timings.
7) **Permanent sample plots**: Primarily designed for gathering data to be used to develop growth and yield models, PSPs also help researchers and planners with disease and/or insect damage monitoring, effects of extreme climatic conditions and the growth response to the "default" regime.
8) **Destructive Sampling**: This can be carried out at harvest age. Trees are felled and cut into sections. At each section a disc is normally cut and the growth rings and bark thickness is measured. This data is used to develop stem-taper equations, which are used for utilisation predictions. Also, branch data is captured and this is used to develop crown patterns, which is also used for log quality predictions.

9) **Nursery growing media mixes and fertilizers**: Similar to the silviculture fertiliser trials, these are designed to investigate seedling growth with different types of growing media. The reason why this type of trial includes fertiliser is that some media types are sterile and require fertilizer to provide nutrition to the seedlings. Various types of media include: soil, composted pine bark, composted rice husks, coco peat (coir), natural peat, vermiculite.
10) **Seedling containers** - Various types of containers have been used to grow seedlings, including plastic sleeves, bio-degradable sleeves and plastic planting trays with or without removable planting tubes. Not only is the growth of the seedling considered in these trials, but their survival in field too. Other important considerations are cost of the containers and delivery cost of the seedling to the field (handling and transport).

1.3. Forest Inventory and Enumeration

Future management decisions, forecasts and volume estimates are based on data from inventories.

UFCL will uses five types of inventory and enumeration:

1. **A network of PSPs:** will be established in the plantations, representative of age class, working circle (management circle), species and site quality. The number of PSPs to be established will be a function of these four factors and sufficient to ensure statistical rigidity during analysis. We estimate that there will be a minimum of 30 PSPs per classification.

   The layout of the PSP will be a plot of 100 trees planting spaces (10 x 10) and measured in the same way as determined by the South African industry group, MMRC (Modelling & Mensuration Research Consortium). Statistical methodologies have been tried and tested in their industry. Variations of these PSP's shall be done to monitor carbon sequestration.

2. **Enumeration:** Enumerations of between 5% and 10% will be conducted in stands at certain times during their lifespan. An early enumeration will be conducted in all eucalypt stands in the third year. For pines, it will be in the fourth year. Other genera will be measured according to their growth. Mid-rotation enumerations will be conducted in most compartments, depending on compartment size and working circle.

3. **Survival assessments** shall be done at least twice within the first year of establishment.

4. **All compartments will be enumerated approximately one year before harvesting** to accurately determine the volume and piece size, essential for harvest scheduling and volume regulation

5. **The final operational measurement** will be comparing the delivered volumes from the harvested compartment to the predicted volume as determined from the pre-harvest enumeration. Thinning controls and pre-harvest enumerations should get priority.

1.4. Implementation

1.4.1. Nursery

UFCL outsources the eucalyptus clone nursery operations where high quality seedlings can be obtained at reasonable cost from other organisations. Where this is not possible, own nurseries are run.

Soil is collected locally for potting mix and treated with mycorrhiza. Each plantation has its own nursery to reduce the transportation time and resultant risk of seedling mortality. Pine seed is pre-treated with hydrogen peroxide to assist in germination.

Where necessary (for Eucalyptus) plastic tunnels and shade cloth structures are constructed to improve germination and survival.

Plants are watered and tended by hand until they are ready to be transplanted out into the plantation. Chemicals are only used in the nursery where absolutely necessary (after infestation or infection is detected) and complies with the company prescriptions for chemical use. Fertilizer with a high Potassium Nitrate level is applied to reduce nursery time and improve the hardiness of seedlings.

1.4.2. Silviculture

1.4.2.1. Site Preparation

The objective of the site preparation is to facilitate planting with the correct stocking and to produce acceptable survival at minimal cost.

Before any stand is established an internal screening assessment shall be completed. All sites will also be checked against the requirements of forest conversion to ensure that no intact woodland or forests are removed to make way for plantation forests.

3.4.2.2. Slash Management

On virgin sites, which have not been previously cleared for forestry or agriculture, bush clearing may be required. This shall involve the slashing of softer vegetation and the felling and cross-cutting of undesirable trees. If the fuel load is sufficient, the vegetation should be stacked in rows and once dry enough burnt. Anthills should be cleared of vegetation too and treated with an approved termicide.

On previously harvested sites it is essential to reduce the debris to a minimum. On sites that will be replanted to eucalyptus, burning can take place if there is sufficient fuel load and conditions are favourable. However, those areas to be re-established to pine will need to be assessed for the potential existence of the

fungus *Rhizina undulata*. If the fungus is observed after the fire, a waiting period of at least 6 months is required prior to the planting of pines.

All prescribed burning shall only be done in conditions favourable to cool burns to help prevent damage to soils and reduce the risk of erosion. At this stage the company will follow a no-burn policy in our country, due to predominant extreme steep terrain conditions. This policy might be reviewed in the future once the company becomes more acquainted with local climatic and geographical conditions.

3.4.2.3. Land Preparation

Those sites that are to be established to Eucalyptus that show signs of termites should be treated prior to planting, this will require the extraction of the queen(s) and then the application of a suitable termicide.

The site should be completely weed-free prior to planting, this may require either a blanket herbicide application on its own or slashing of the weeds followed by herbicide application. Only chemicals not banned by FSC or international regulation will be utilised.

Marking and pitting, respectively, shall be done in a single team operation, with a baseline being laid out in the compartment prior to any marking. Individual marking and pitting shall not be allowed.

Manual marking and pitting is currently being investigated by the company with a view of introducing mechanical options on a larger scale to improve quality and survival.

3.4.2.4. Species/Site Matching

In order to achieve sustainability and yield requirements of the forest it is critical that species and sites are matched correctly. This will minimize the risk of losses due to fire, drought, and hail.

It is desirable that prior to operations commencing, a thorough soils survey of the areas to be planted is carried out. Information gleaned from this should be the basis on which species choice is determined. Unfortunately, it is not always possible to carry out a soil survey, in these cases conditions need to be compared to previously planted areas and an informed decision be made.

For ease of classification, the general operational areas will be divided into two classes, tropical-moist conditions and sub-tropical conditions.

3.4.3. Planting

The objective of planting practice is to achieve a fully stocked stand of uniform size and growth of seedlings at minimal cost in the shortest time following clear felling or Greenfield land clearing.

The start and end of the planting season cannot be predicted and depends upon many factors, and may precede and last longer than the rainy season where availability of water and ameliorants is authorised. During the planting season, planting commences once 50mm of rain has been recorded.

3.4.4. Watering

After cost and condition assessments water of plants infield is permitted during extreme weather conditions, in addition soils ameliorants is also allowed. Provision for watering will be made using water cans and bulk water transport to roadside.

3.4.5. Blanking

The post-planting survival of all plantings should be assessed 30 days after planting for all species, then 90 days after planting for eucalyptus and 180 days after planting for pine. Then again at 1year for all species. The assessment should take into account the pattern of mortality within the stand. The 30-day assessment is the responsibility of the Silviculture Forester, and the 90 day and beyond assessments shall be done by the Technical Forester. Results of all assessments must be reported to the planning department.

For normal assessments, blanking should take place whenever survival falls below 80%. If there are, patches of 0.5 hectares or greater that have less than 80% survival or patches of 0.1 hectares or greater with less than 60% survival, then blanking should take place even if the overall average survival exceeds 80%.

Do not blank if the reason for mortality is not known. If the mortality is thought to be *Fusarium spp*., then a fresh pit needs to be prepared as the old pit is probably infected and will cause the blanked plant to die too.
The same species should always be used for blanking.

3.4.6. Fertilization

The objective of fertilizer application is to correct for nutrient deficiencies so as to realize the full yield potential of a site. Two operations will be conducted in UFCL as described below.

If possible, soil analyses should be carried out at the time of the soil surveys. However, often this is not possible therefore a blanket recommendation is made to fertilise all eucalypts and those pines that have been planted on nutrient poor sites (naturally due to geologies or manmade with old agricultural lands).

For post planting, fertilising application must be done at the same time as planting or within one week thereafter.

3.4.7. Weeding

The objective of weed management in commercial areas is to eliminate competition for growing space and release a site to the tree for maximum growth, i.e. eliminate competition for moisture and nutrients, remove shading and maximize photosynthetic capacity. The objective in conservation areas is eliminating weed or maintaining a maintenance mode (<20%) weed in conservation areas.

Weed control for the open areas is scheduled as part of the management plans for the FMA. The priorities and schedules for weeding operations in open areas shall be documented in an APO.

Control of weeds should be based on management programmes aimed at reducing weed intensity over the entire land holding of UFCL with low impact methods being given first priority. An UFCl in-house screening assessment shall be done where methods that are more intrusive are considered the best available method (For Example aerial application of herbicides).

Weed control before planting:

- Weeds controlled using burning, and if necessary a chemical pre-plant spray before planting

Weeding – Year 1

- No suppression or stress on the planted crop.
- Manual hoeing and slashing and chemical weed control methods shall be used.

Weeding - Year 2:

- No suppression or stress on the planted crop.
- Manual hoeing and slashing and chemical weed control methods shall be used.

The company shall frequently revisit the effectiveness of its weeding regimes and implement the best practise to reduce weed load allowing more nutrients and moisture to be available to the trees and reducing the fuel load thus reducing the fire risk.

UFCL shall document all chemical use per compartment on the chemical register, aimed at reducing chemical use over the long term on plantations, while continuing to ensure effective weed control.

3.4.8. Integrated alien weed control

Alien invasive plants are commonly found along river courses or in previously disturbed grassland or forest areas. An integrated weed plan has been developed, indicating pre-plant weeding, maintenance weeding, noxious (alien invasive exotic) weeding and conservation weeding.

The basis for weed control and planning is planted compartments and conservation units. Priorities are based on maintaining representative samples of natural ecosystems, the conservation significance and plant survival, the need to maintain cleared areas and the systematic clearing of new areas through the block weeding approach. Where possible, alien invasive weeding allocation follows the approach of conservation significance and maintenance possibility.

<u>Priorities for the Plantations</u>:

Priorities are set in the hope of minimizing the total long-term load, and hence cost of an operation, in terms of resources, money and opportunities.

The following will also play a role:

1. infestations with high priority emerging species that are likely to spread to uninfected areas
2. infestations present that are easily controlled without rehabilitation work being required
3. significant areas that are likely to be easily maintained over the long term once cleared
4. clean and well maintained areas immediately neighbouring them
5. downstream users that are directly impacted by the weeds present
6. predominant weed species for which there are effective biocontrol agents available
7. opportunities for improving public awareness/relations

To ensure the success of the programme, special attention will be paid to the following:

1. keeping accurate records of costs and work done
2. keeping to the programme by ensuring follow-ups are done
3. understanding the prevailing environmental conditions and having sufficient flexibility in the plan to incorporate the variation in conditions

A successful alien management programme includes objective setting and prioritizing, management strategies, control methods, monitoring, evaluation and follow-up, programme management, securing resources, stakeholder involvement and training.

Post planting weeding operations can be summarized as follows:

- **Post-planting** – 2 years of weeding – including adjoining natural areas.
- **Access for Pruning weeding**– weeding, including adjoining natural areas.

- **Access for mark for Thinning weeding** – this is carried out on a planned basis, in conjunction with weed control in Natural Areas:
- **Access for harvesting weeding -** this is carried out on a planned basis, in conjunction with weed control in Natural Areas:
- **Special projects weeding –** Weeding tactics in areas not covered above

  1st priority – follow-up on areas done the previous year

  2nd priority – weed control to reduce the weed problem by tackling the lightly infested areas first, working towards the heavily infested areas.

Monitoring of areas will be done so as to ensure the above plan is working, the budget and APO's will be the basis of planning.

The ultimate goal of the Plantation's weed control programme is the preservation or restoration of vital ecosystems and habitats. An elimination of invasive plants is a tool to achieve the objective, but not the goal.
Due to the high cost and short-term results obtained with manual weeding, this is only considered where it is effective.
No bio-control programme is currently active on Plantation. *Conservation management MPs, and APO's for further details.*

3.4.9. Pruning

Pruning is primarily an operation related to pines, however eucalypts grown for saw timber will be subject to active pruning and brushing upon management discretion.

UFCL does not currently prune pine specie any higher than 2m for access. It is not believed at this stage that the timber markets where we operate in are paying any premium for clear lumber. However, this practice might be reviewed frequently in which case a decision to introduce further pruning heights will have

the objective of pruning for saw timber production to improve timber quality by minimising the knotty-core of the stem, yet at the same time not reducing the photosynthetic ability of the plant to continue growing at a normal rate. UFCL would like the knotty-core of their trees not to be larger than 20cm.
Where practical pruning shall be scheduled during the dry season.

3.4.10. Marking for Thinning

Before any thinning operation all compartments shall be marked according to Marking for Thinning MP

3.4.11. Thinning

All thinning will be based on retaining a certain number of stems per hectare based on site class and age at the time of the thinning operation, with the intention of reducing stocking, improving stand quality and optimising the site.

All thinning operations are regarded as harvesting operations and subject to the harvesting sections of the IMS this policy.

Depending on the initial spacing all compartments shall thinned according to the MP thinning schedules.

3.5. Forest Engineering

Forest Engineering activities will be conducted in a professional and responsible manner to ensure a healthy, safe and productive work environment, while applying sound environmental practices and producing high quality timber for further processing. UFCL strives for the lowest sustainable combined harvesting, roads and transport cost.

Machine operators shall be properly recruited, selected and trained for the particular machine they will be operating.

Machine operators should be remunerated at rates which are competitive in the market.

Harvesting Company structure: Harvesting operations will be centralised in Forestry department with the function reporting to the Forestry Lead. This critical mass of annual harvestable volume ensures the cost-effective implementation of harvesting systems.

3.6. Outsourcing of harvesting operations

UFCL shall favour retaining that portion of the harvesting operations, which are capital intensive by nature.

3.7. Harvesting systems selected by UFCL

Selection of harvesting systems and justification is detail in individual PMP is based on unique requirements and conditions found on the concession. An interest rate will be used, as determined by the Financial Manager.

4. Management of Native species

a. Pre-Harvest Planning

- **Survey and Assessment:** before any harvesting activity a survey of the area is conducted to assess the presence of native species, their habitats, and ecological significance. This includes identifying threatened or endangered species.

- **Habitat Mapping:** Map sensitive habitats that may need special attention during harvesting, such as nesting sites, water bodies, or critical migration corridors.

b. Monitoring and Adaptive Management

- **Ongoing Monitoring:** Regularly monitor the health of native species and ecosystems before, during, and after harvesting to track impacts and ensure that management strategies are effective refer to APO for conservation area management and exotic species monitoring
- **Adaptive Management:** Adjust practices based on the monitoring results, incorporating feedback to improve the outcomes for native species and ecosystems.

c. Soil and Water Protection

- **Soil Conservation:** referrer to the FMP there are clear and available erosion control measures to protect native plant species and prevent habitat degradation.
- **Water Quality Protection:** UFCL Ensure that harvesting practices do not lead to sedimentation or pollution of nearby water sources, which could affect aquatic species and ecosystems.

d. Post-Harvest Restoration

- **Revegetation:** After harvesting, we focus on restoring native vegetation through planting or natural regeneration techniques to maintain habitat and food sources for native species.

- **Invasive Species Control:** After harvesting, we remove invasive species that may outcompete native flora and fauna, potentially disrupting the ecosystem balance.

e. Community and Stakeholder Involvement

- **Local Knowledge:** UFCL Engage with local communities and stakeholders who have traditional ecological knowledge of NPBZ. This help on a more effective management practice.
- **Collaboration:** UFCL Works with environmental organizations, regulatory agencies, and other stakeholders to ensure that native species are adequately protected during the harvesting process.

By incorporating these strategies, UFCL manages native species during harvesting by promote ecological sustainability, prevent long-term damage to ecosystems, and help ensure that biodiversity is preserved for future generations