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ENVIRONMENTAL MANAGEMENT PLAN FOR

BUSH THINNING AND CHARCOAL PRODUCTION FOR THE REGISTERED JUMBO CHARCOAL GROUP SCHEME MEMBERS

Prepared for

JUMBO CHARCOAL NAMIBIA (PTY) LTD

JULY 2021

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Environmental Compliance Consultancy CC
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TITLE AND APPROVAL PAGE

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Confidentiality

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EXECUTIVE SUMMARY

Environmental Compliance Consultancy (ECC) has compiled this updated EMP report to accompany an application for the renewal of a current environmental clearance certificate in accordance with the Environmental Management Act, 2007 on behalf of Jumbo Charcoal Namibia (Pty) Ltd (Jumbo). The purpose of this application is to ensure the existing Jumbo Group Scheme members complies with legal requirements set out in the Environmental Management Act, 2007 with regards to bush thinning and charcoal production in Namibia.

The Jumbo Group Scheme was first registered in 2001 under the Forest Stewardship Council (FSC). Farm management units (FMUs) registered under the Group to produce charcoal as a secondary or subsidiary practice, thinning out the heavily encroached land for higher grazing capacity, therefore increasing carrying capacity for livestock and or game (main practice). As charcoal production is a secondary or subsidiary practice for most commercial farmers, Jumbo seeks to assist the registered group scheme members to stay legally compliant to ensure sustainable and responsible combat of bush encroachment in Namibia.

The report is a strategic document presenting the environmental framework for all units registered under the Group Scheme to adhere to. Whilst it satisfies the requirements of the Environmental Management Act, it sets out what each FMU must adhere to, to meet additional national regulatory requirements as well as international frameworks, such as FSC. Should an FMU not comply with the requirements set out in this EMP or meet the FSC standards, the FMU would be suspended and not be allowed to operate or sell under the FSC trademark.

Bush thinning and charcoal production activities can potentially result in adverse environmental impacts, such as reduced soil quality through erosion after vegetation clearance, disturbance to flora and fauna through bush thinning activities, temporary loss of habitat and thus reduction in biodiversity, and increased surface runoff during rainfall events leading to reduced surface water quality and soil erosion.

A generic environmental management plan (EMP) has been developed that would apply to all the registered Group Scheme Members and the FMUs on which they operate. The EMP shall be amended for each unit to ensure site-specific environmental issues are appropriately managed and impacts avoided and reduced.

The report provides confidence to the competent authority that any FMU operating under the Jumbo Group Scheme shall be legally compliant and apply international best practice measures. The requirements set out under the Environmental Management Act and associated Regulations are adhered to and therefore it is of the opinion of ECC that an Environmental Clearance Certificate should be issued, on condition that the management and mitigation measures of this EMP are adhered to.

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ABBREVIATIONS

ABBREVIATIONS	DESCRIPTION
AIDS	Acquired Immune Deficiency Syndrome
CIA	Cumulative Impact Assessment
DEA	Department of Environmental Affairs
DoF	Directorate of Forestry
ECC	Environmental Compliance Consultancy
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
FMP	Farm Management Plan
FMU	Farm Management Unit
FSC	Forest Stewardship Council
GEMP	Generic Environmental Management Plan
I&APs	Interested and Affected Parties
HIV	Human Immunodeficiency Virus
MAWLR	Ministry of Agriculture Water and Land Reform
MEFT	Ministry of Environment, Forestry and Tourism
MSDS	Material Safety Data Sheet
NSA	Namibia Statistics Agency
PPE	Personal Protective Equipment
SLIMF	Small and Low Intensity Managed Forests
TB	Tuberculosis
TE	Tree Equivalents
WHO	World Health Organisation

DEFINITIONS

TERMS	DESCRIPTION
Farm Management Unit	A spatial area or areas, with clearly defined boundaries, that submitted for FSC certification and are managed to a set of explicit long term management objectives that are clearly defined within the FMP.
Farm Management Plan	Collection of documents, reports, records, and maps that describe, regulate and justify the activities on an FMU.
Group Scheme Certification	Group certification is available to make it easier for small FMU/forest owners to become FSC certified.
Group Scheme Member	FMU that forms part of various other FMUs, operating under a single organisation that holds a valid FSC certification
Jumbo Charcoal Group Scheme	Jumbo Charcoal is the FSC certification holder and has various FMUs, operating under this certificate.
Group Scheme Manager	Individual or an organisation that is responsible for overseeing all activities on FMUs and ensuring that group scheme members comply with all relevant legislation and with the FSC standard in general.
A7 Register	Workbook used by the Group Manger to keep record of all the FMUs and contains relevant information for each FMU, which includes, farm name, farm size, owner/producer information, coordinates, FSC related information, allowable use etc. (Table 4).

1 INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

The purpose of this document is to provide a management framework for the existing bush control and charcoal production activities on Jumbo Charcoal Group Scheme Members and their Farm Management Units (FMUs), so that the potential negative impacts that could arise during operations are avoided, minimised, and mitigated as far as reasonably practicable, positive impacts resulting from the operations can be enhanced and statutory requirements and other legal obligations are fulfilled.

This report has been prepared by Environmental Compliance Consultancy (ECC). ECC's Terms of Reference for this report were to set out a description of the Jumbo Group Scheme and set out information and measures to comply with the Environmental Management Act including how FMUs comply with national regulatory requirements and FSC standards.

As the environmental clearance application is for a Group Scheme whose members are constantly changing, this report presents a strategic document providing the environmental framework for FMUs to follow and comply with. As such, this report does not set out specific details for each FMU such as a site description or the receiving environment surrounding each unit registered at the time of writing/application submission. Certified FMUs registered to the Group Scheme varies frequently for various reasons including units utilising resources; operations being suspended due to production breaks or other reasons such as economic, or farms being sold.

Specific physical information related to each FMU is recorded, maintained, and monitored following the frameworks set out in the EMP in the Farm Management Plan (FMP) which is developed per FMU.

1.2 BACKGROUND OF THE PROJECT

The Company, Jumbo Charcoal Namibia (Pty) Ltd (Jumbo) founded in 1989, is involved in the sifting, packaging, and exporting of charcoal made from thinning encroaching tree species on commercial farms in Namibia. FMUs produce charcoal as a secondary or subsidiary practice, thinning out the heavily encroached land for higher beef/cattle production (main practice). The encroaching bush are indigenous species and includes, but not limited to *Senegalia mellifera, Vachellia reficiens, Vachellia luederitzii, Senegalia erubescens and Dichrostachys cinerea.*

To obtain a competitive edge in the forest exports marketplace, Jumbo has registered as a Group Scheme under the Forest Stewardship Council (FSC). FSC is an independent, non-profit, non-governmental organisation dedicated to the promotion of responsible forest management worldwide. FSC Group Schemes are an international programme, which allows individuals (in this case farmers/charcoal producers) to commit to managing their forests responsibly.

The Jumbo Charcoal Group Scheme was first registered in 2001 by the FSC. Since 2001 FMUs have been certified under the Jumbo Group Scheme for bush thinning and charcoal production for the export market. For a producer to sell FSC certified charcoal to Jumbo, the producer must be registered under the FSC Jumbo Group Scheme, which compels the producer to comply with the FSC principles and criteria. As charcoal production is a secondary or subsidiary practice for most commercial farmers, Jumbo seeks to

assist the registered group scheme members to become legally compliant to ensure sustainable and responsible combat of bush encroachment in Namibia.

The purpose of this report is to accompany the application for the renewal of an environmental clearance certificate for the Jumbo Charcoal Group Scheme - bush thinning and charcoal production. Environmental Compliance Consultancy (ECC) has compiled this Environmental Report under the Environmental Management Act, 2007 (Act no. 7 of 2007) and associated Regulations on behalf of Jumbo Charcoal Namibia (Pty) Ltd. (Figure 1).

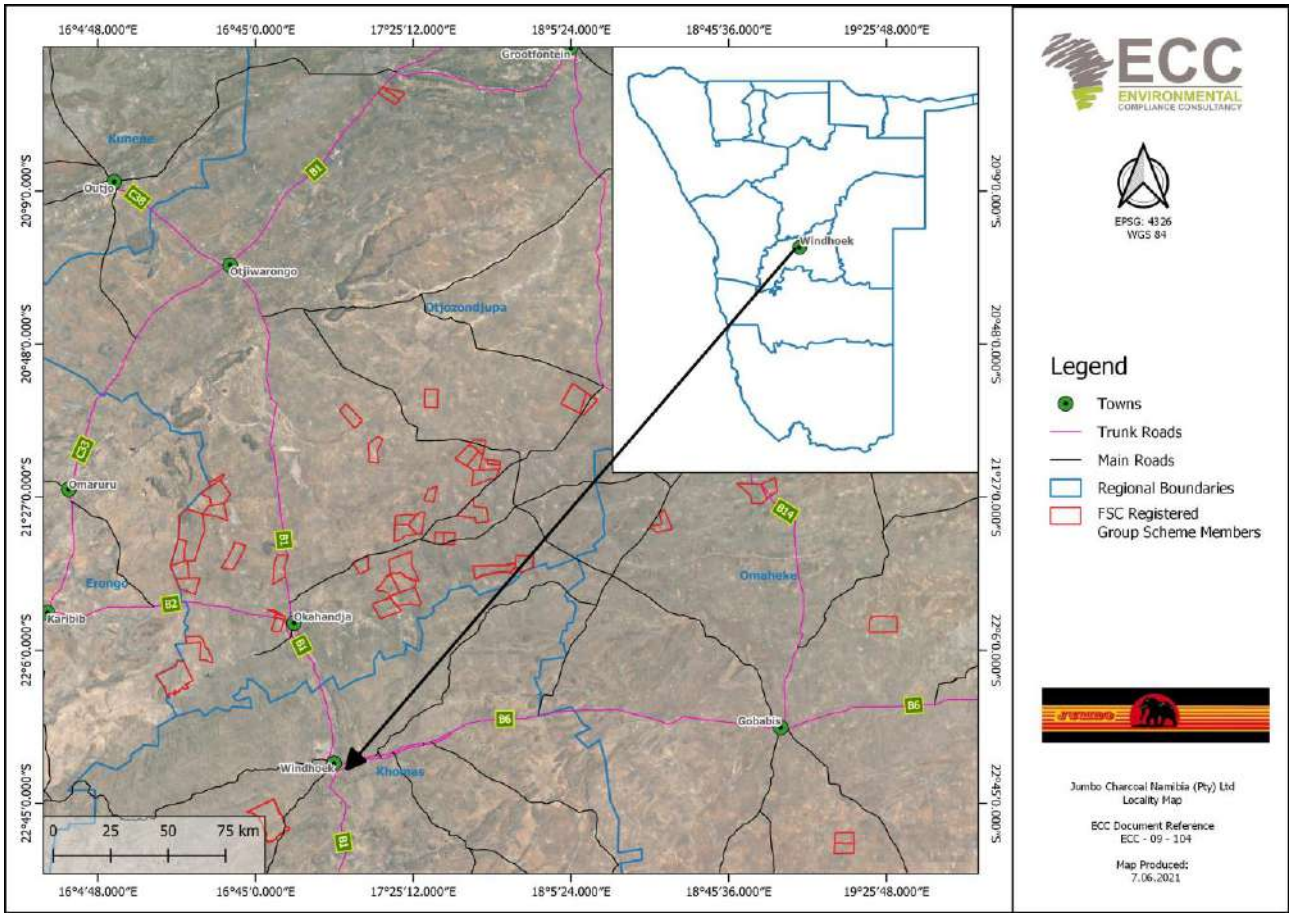

FIGURE 1 - LOCALITY MAP OF THE CURRENT FSC REGISTERED JUMBO GROUP SCHEME MEMBERS (FMUs).

1.3 GROUP SCHEME MANAGEMENT

This report discusses the requirements and products that each FMU must adhere to and produce to be registered, certified, operate and sell under the FSC trademark and to be compliant with national regulatory requirements. Without complying with these requirements, the unit would not achieve certification through the FSC, thus not allowed to operate or sell under the FSC trademark. ECC acting as the independent auditor and Group Scheme Manager shall review each unit to ensure that they meet all EMP and FSC requirements.

1.4 OBJECTIVES OF THIS DOCUMENT

Objectives of this document can be summarised as follows:

- Determine key issues associated with the existing bush control and charcoal producing activities and identify measures to mitigate negative impacts and to enhance positive impacts associated with the activities.

1.5 ENVIRONMENTAL CONSULTANCY

Environmental Compliance Consultancy (ECC) was appointed Jumbo Charcoal Namibia (Pty) LTD to update the EMP in terms of the Environmental Management Act, No. 7 of 2007 and its regulations, for the renewal of the current Environmental Clearance Certificate.

ECC is a Namibian consultancy (registration number Close Corporation 2013/11401) and has prepared this EMP on behalf of the Jumbo Charcoal. ECC operates exclusively in the environmental, social, health and safety fields for clients across Southern Africa, in both the public and private sectors. ECC is independent of Jumbo Charcoal and has no vested or financial interest in the proposed project, except for fair remuneration for professional services rendered in the preparation of this EMP.

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2 LEGAL FRAMEWORK

2.1 NATIONAL LEGISLATION

Table 1 provides a list of some essential legislation applicable to the existing bush control and charcoal production activities of the Jumbo Group Scheme, a full list of applicable and possibly relevant legislation is attached to this report (Appendix B – Legal Register).

TABLE 1 – LEGAL COMPLIANCE

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
Constitution of the Republic of Namibia of 1990	The constitution clearly defines the country's overarching position concerning the well-being of Namibians, sustainable development, and environmental management. The constitution refers that the state shall actively promote and maintain the welfare of the people by adopting policies aimed at the following: *"Maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present, and future …"*	Jumbo Charcoal is committed to the protection of the environment as enshrined in the constitution. Furthermore, the Group Scheme wants to engage the local community for the proposed project by providing local jobs as well as exploring ways of finding benefits and contributing to the development of Namibia.
Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005 and its regulations	This act presents laws relating to the management and use of forests and forest produce. It also presents provisions for the protection of the environment and the control and management of forest fires. Some of the specific details in the act of particular relevance are: - Aerial spraying of arboricides is illegal, but the application of arboricides by hand is allowed. - Cutting, destruction or removal of any living tree, bush or shrub within 100 m of a drainage course is illegal. The Directorate of Forestry (DoF) under the Ministry of Environment, Forestry and Tourism (MEFT) is responsible for the administration of this act.	The act governs bush clearing and thinning initiatives to combat bush encroachment; therefore, the act is applicable to any bush harvesting activity anywhere in Namibia. The act also permits allowable harvests, the transporting, and marketing and exporting of forest produce. Conditions are stipulated per licence/permit (e.g. no tree with a stem diameter of >18 cm at ground level may be removed; no protected species may be removed, etc.).

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
Environmental Management Act, (No. 7 of 2007) and its regulations, including the Environmental Impact Assessment Regulation, 2007 (No. 30 of 2012)	The act aims to promote sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment. It sets the principles of environmental management as well as the functions and powers of the minister. The act requires certain activities, which may have a detrimental effect on the environment, to obtain an environmental clearance certificate prior to project development. The act states an EIA may be undertaken and submitted as part of the environmental clearance certificate application. The act and its regulations need to be given due consideration to achieve proper waste management and pollution control by means of the cradle to grave responsibility, precautionary principle, the polluter pays principle and the principles of public participation and access to information. The MEFT is responsible for the protection and management of Namibia's natural environment. The DEA under the MEFT is responsible for the administration of the EIA process.	This GEMP documents the findings of the assessment undertaken for the proposed operations, which will form part of the environmental clearance application. The assessment has been undertaken in line with the requirements under the Forestry Act, which states that any bush clearing activity on more than 15 ha, triggers the need for a permit from DoF, and this in turn triggers the need for environmental clearance.
Water Act, No. 54 of 1956	The act enables the minister to declare a Water Management Area for the purpose of protecting any water resource, riverine habitat, watershed, wetland, environment or ecosystem at risk of depletion, contamination, extinction or disturbance from any source. The act restricts a number of activities, including water abstraction, the use of pesticides, the clearing or harvesting of vegetation, including the felling of trees and the removal of riparian growth.	The act requires appropriate management of water catchments and aquifers. The act stipulates that a person may not discharge effluent directly or indirectly to any water resource unless such person follows a permit issued in terms of Section 60. Should the project require abstraction of water from underground sources, an application should be submitted to the authorities.
Soil Conservation Act, No. 76 of 1969 and the Soil	The act makes provision for the prevention and control of soil erosion and the protection, improvement and conservation of soil and	The competent authority may issue directives to landowners in respect of the prevention of erosion, the denudation, disturbance, or

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
Conservation Amendment Act, No. 38 of 1971	vegetation.	drainage of land; and any other disturbance of soil which may create any form of erosion or pollution or silting.
National Heritage Act, No. 27 of 2004.	The act makes provision for the protection and conservation of places and objects with heritage significance. Section 55 requires the reporting of any archaeological findings to the National Heritage Council after which a permit needs to be issued before the find can be disturbed.	There is potential for heritage objects to be found during the operations, therefore the stipulations in the act have been taken into consideration and are incorporated into the GEMP. The project shall be compliant with Section 55 of the act.
Labour Act, No. 11 of 2007	Regulations relating to the occupational health and safety provisions of employees at work were promulgated in terms of Section 101 of the Labour Act, No. 6 of 1992 and gazetted in 1997. Accordingly, stringent health and safety policies, including the compulsory use of specific PPE in designated areas to ensure adequate protection against health and safety risks, have to be in place. Proper storage and labelling of hazardous substances are required. Implementing of a comprehensive waste management and disposal policy is necessary - this should include the management and disposal of hazardous substances. Employees in charge of and working with hazardous substances need to be aware of the specific hazardous substances in order not to compromise worker and environmental safety in the event of accidental breakage or spillage. Transport of various hazardous substances requires staff responsible for such transport to be properly trained in the handling of the substance and that adequate safety and emergency response plans are place in case of accidental spillage.	The proposed operations will comply with stringent health and safety policies, including the compulsory use of specific PPE in designated areas to ensure adequate protection against health and safety risks. Proper storage and labelling of hazardous substances are required. Employees in charge of and working with hazardous substances need to be aware of the specific hazardous substances in order not to compromise their own safety and potential environmental damage.

2.2 POLICIES

Table 2 provides a list of policies relevant to the proposed bush control and charcoal production activities on Jumbo group scheme farm units.

TABLE 2 - POLICY FRAMEWORKS RELEVANT TO THE PROJECT

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
Vision 2030	Vision 2030 sets out the nation's development programmes and strategies to achieve its national objectives. It sets out eight themes to realise the country's long-term vision and states that the overall goal is to improve the quality of life of the Namibian people to a level in line with the developed world.	Vision 2030 recognises that bush encroachment reduces rangeland productivity and notes that bush encroachment is complex and expensive to reverse. The planned operations aim at the overall goal to ensure job opportunities and a better living standard for Namibians as well as increasing productivity.
Fifth National Development Plan (NDP5)	NDP5 is the fifth in the series of seven five-year national development plans that outline the objectives and aspirations of Namibia's long-term vision as expressed in Vision 2030. NDP5 is structured on the pillars of economic progression, good governance, social transformation, and environmental sustainability.	The proposed operations form part of the bigger picture of achieving economic progression, social transformation, and environmental sustainability.
National Agriculture Policy (2015)	This policy recognises multiple problems caused by bush encroachment and strives to "establish mechanisms to support farmers in combating bush encroachment effectively over the short and long term"	Combating bush encroachment at the farm is approached as a long-term initiative to improve rangeland productivity.
National Forest Policy (1992)	This policy is guided by the following documents: The **Namibia Forestry Strategic Plan** aims at the protection and sustainable utilization of natural forests, with the objectives to conserve ecosystems, increase agricultural productivity, conserve soil and water, alleviate poverty, protect biodiversity, and prevent climate change. The **Namibia Forest Development Policy** emphasizes biodiversity conservation by empowering farmers to manage forest resources sustainably. In commercial areas the policy encourages de-bushing for charcoal production to enhance rangeland productivity.	The proposed operations are in line with the objectives to increase rangeland productivity, to utilise natural resources sustainably and to enhance the protection of biodiversity.
National Rangeland Management Policy and Strategy (2012)	This document aims to enable farmers to manage their rangeland resources in such a way that animal production per hectare is sustainably improved, vulnerability is	The proposed operations are aligned to the objectives of this document.

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
	decreased, and biodiversity is improved so that rangelands can continue to provide essential ecosystem services.	

2.3 PERMITS

Table 3 provides a list of permits required for the proposed bush control and charcoal production activities on Jumbo group scheme farm units.

TABLE 3 - FORESTRY PERMITS RELEVANT TO THE PROJECT

LEGAL INSTRUMENT	ACTIVITY TO BE UNDERTAKEN	PERMIT VALIDITY
Harvesting permit	Required from the DoF for any tree cutting and/or harvesting of wood in an area greater than 15 hectares per year. The area to be harvested will be inspected before the permit is issued.	Valid for three months for commercial purposes, seven days for communal purposes and three days for own use.
Transport permit	Required from the DoF to convey any wood or wood products in Namibia.	Valid for seven days for commercial purposes, three days for own use.
Export permit	Required from the DoF to send any wood or wood products outside Namibia	Valid for seven days
Marketing permit	Required from the DoF to enable the producer to sell wood or wood products to any other party.	Valid for three months in commercial areas and one month in communal areas.

2.4 ENVIRONMENTAL CLEARANCE CERTIFICATE

The Environmental Management Act, No. 7 of 2007 stipulates that an environmental clearance certificate is required to undertake listed activities in terms of the Act and its regulations. Jumbo is already in the possession of an ECC for the bush control and charcoal production activities for their Group Scheme Members.

In 2017 the Ministry of Agriculture, Water and Forestry and the Ministry of Environment and Tourism jointly issued a publication to streamline and simplify the legal process authorising people to combat bush encroachment in Namibia (Ministry of Agriculture, Water and Forestry and Ministry of Environment and Tourism, 2017). This is based on the *strategic environmental assessment of large-scale bush thinning and value-addition activities in Namibia* (SAIEA, 2015) which distinguishes three categories of thresholds for the environmental impact assessment (EIA) process on bush control activities (Figure 2).

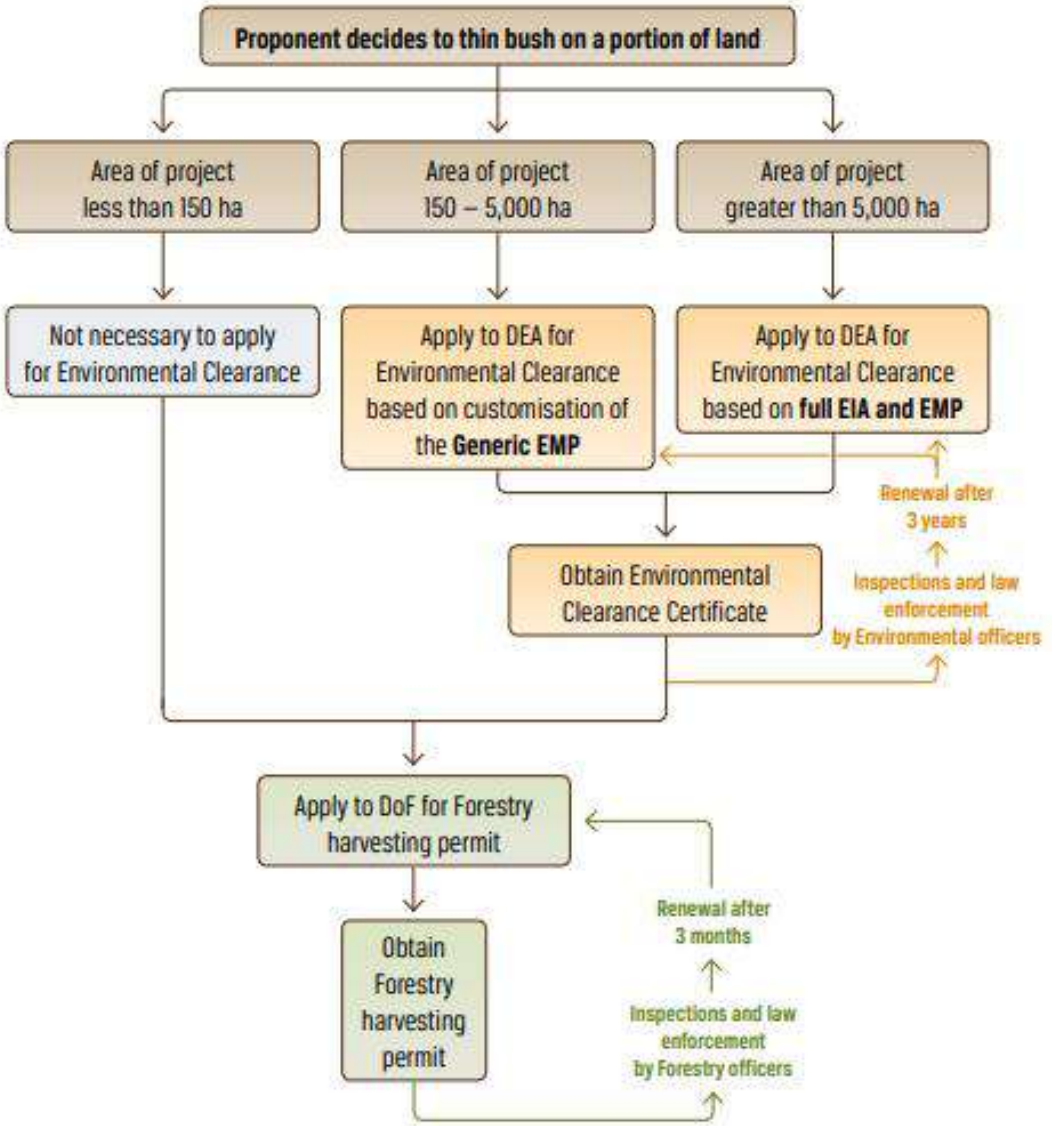


FIGURE 2 - BUSH HARVESTING EIA PROCESS (Source: Ministry of Agriculture, Water and Forestry and the Ministry of Environment and Tourism, 2017)

3 PROJECT DESCRIPTION

3.1 INTRODUCTION

This Chapter details the activities that shall be undertaken under the Jumbo Charcoal FSC Group Scheme and on each FMU. An overview of FSC, benefits of being FSC certified and what a Group Scheme is, are also provided in this Chapter. It then goes on to provide specific information on the Jumbo Group Scheme and specific requirements.

3.2 BUSH THINNING & ENCROACHMENT

3.2.1. DEFINITION

Bush thinning is defined by the Namibian FSC standard as, "The removing of selected woody species under the guidance of forestry permits and management plans. All bush thinning should aim to leave a heterogeneous mix of trees and bush. The veld that remains should have a variety of tree species (including some of the encroacher species), of different size classes." Encroachment (bush thickening) is defined as "the invasion and/or thickening of aggressive undesired woody species (i.e., target spp.) resulting in an imbalance of the grass: bush ratio, a decrease in biodiversity, and a decrease in carrying capacity." (FSC 2020).

3.2.2. OPERATIONS OF BUSH THINNING

Bush thinning can be undertaken through various means, such as manual (e.g., chainsaws and chopping), mechanical (e.g., excavators and bulldozers) or use of chemicals. Sustainable bush thinning would not apply chemicals and aims to leave a heterogeneous, mix of trees and bushes. A rule of thumb is to harvest only 30-35% of the total available biomass. All protected plant species should not be harvested although exceptions are made in cases of high densities and cases of species such as *Colophospermum mopane*.

3.2.3. NEED AND DESIRABILITY OF BUSH THINNING

Agriculture is the predominant land use in Namibia, where some 70% of the population depends directly or indirectly on the natural rangeland resource for their economic well-being and food security (Joubert, 2014). Beef production is the most important livestock-related activity in Namibia, followed by small stock (sheep and goat production) (Joubert, 2014).

Currently, the degraded state of Namibia's rangeland is most pronounced in the areas of soil erosion, bush encroachment, loss of perennial grasses and deforestation (Cunningham 1998). Regarding bush encroachment, it is known that more or less 30 million hectares (ha) in Central and Northern Namibia is subject to this phenomenon (Joubert, 2014). The primary encroacher species north of the 23-degree latitude line include *Senegalia mellifera, Senegalia erubescens, Dichrostachys cinerea, Vachellia reficiens, Terminalia sericea, Colophospermum mopane, Rhigozumtichotomum and Acacia brownii* (Joubert, 2014).

Average bush densities on the Thornbush Savanna areas of Namibia are estimated at 6,000 bushes per ha. In some areas in the central and northern commercial farming areas, bush densities of between 14,000 and 20,000 bushes per ha have been recorded (Joubert and Zimmermann, 2002). In some cases, land productivity has decreased equating to a drop in carrying capacity from 1LSU (Large Stock Unit) per 10 ha to 1LSU per 20 or 30 ha (Joubert and Zimmermann, 2002).

As stated in the National Rangeland Management Policy and Strategy (MAWF, 2012), with the current situation of Namibia's rangelands and the current and potential impacts thereof on the livelihoods of a larger number of Namibians, it is of paramount importance that something is done.

Thinning of bush encroachment is recognized as a priority in Namibia's agricultural and development policies. The benefits of bush thinning include the following (SAIEA, 2015):

- Employment and greater opportunities for income generation in rural areas
- Improvement of rangeland productivity
- Improvement of groundwater resources, reduction of vulnerability to climate change
- Improvement of biodiversity and ecological integrity of savannas
- Training and skills improvement
- Potential boost to the power sector, both in off-grid areas as well as in improving generation capacity over the whole grid.
- Power generation from renewables – less demand on non-renewable sources, and less net CO2 emission

Combating bush encroachment in Namibia has developed into a huge biomass resource, estimated at 200 to 300 million tonnes per annum (CCA 2010). Measures implemented to combat bush encroachment create positive opportunities for the Namibian economy, such as the Namibian charcoal industry. There are about 240 active producers and 6,000 people directly and indirectly employed through this industry. The annual production is about 85,000 to 100,000 tonnes, of which 99 per cent is exported (Smit 2014). In addition, tree thinning improves the quality of pasture.

3.2.4. MANUAL BUSH CONTROL

This type of activity is most suitable for small-scale operations where cost and time are less important. It is labour-intensive and time-consuming but, if well supervised, a highly effective method of control. Hand tools such as axes, bush picks, handsaws, and pangas are used to take out individual bushes. The method is highly selective, making it ecologically sustainable. Manual bush control has few negative environmental impacts though - if not well supervised and if harvesters are not well trained, there is a risk that non-target plants may be removed.

Workers need to be sufficiently trained to ensure that the removal of plants is in line with forestry regulations and health and safety guidelines. To reduce the incidence of re-growth, stumps should either be chemically treated or should be felled below the soil. Some species are likely to coppice if felled, hence aftercare is required.

FIGURE 3 - IMAGE SHOWING BUSH FELLING USING A HAND TOOL (Source: Bush Control Manual, 2017)

3.2.5. SEMI-MECHANISED BUSH CONTROL

Horizontal and vertical trolley saw cutters are produced locally and are commonly used for bush control in Namibia. This is another labour control method, whereby handheld or pushed power tools are used to fell individual plants. This method is selective and more efficient than manual bush control. Tools like chainsaws powered by small, mounted engines, brush cutters and trolley saws, are useful when operated by trained operators. These mobile saws come with horizontal or vertical saw blades for ease of use under all conditions. In some cases, access can be difficult and may often require teams of two or more people per power tool. This is necessary to reduce the risk of injury and improve efficiency. For safety reasons and to ensure that non-target bushes or trees are not removed, supervision and sufficient training are important.

FIGURE 4 - IMAGE SHOWING A HAND-OPERATED SAW-MOBILE BEING USED (Source: Bush Control Manual, 2017)

3.2.6. APPLICATION OF ARBORICIDES

Arboricides are chemicals used in killing woody plants such as invader bushes. These chemicals are solutions diluted with water to a recommended concentration. The substance is applied to the soil, to the leaves and the cut stem. For this project, the farmer proposes they stem-applied method in combination with manual and semi-mechanised control methods, as an after-care intervention. This is done by carefully spraying the solution only to stems to be killed. Since it is applied in small amounts to small areas, it is one of the most selective and safest aftercare methods of bush control.

In addition to the use of arboricides, after-care requires continuous monitoring of the harvested areas and the identification of appropriate activities such as controlled burn, removal by hand, or the introduction of browsers such as goats.

3.2.7. PRODUCTS OF HARVESTED WOOD

Income-generating activities such as the production of woodchips, firewood, droppers and charcoal turn the negative consequences of combating bush encroachment into economically viable results and create additional employment, while at the same time rehabilitating degraded ecosystems.

Firewood and droppers are normally produced for their consumption and/or the local markets whereas the production of woodchips for energy production is an emerging market. For charcoal, there is an established market for export and the producer needs to establish a network to access this market.

Guidance for charcoal production is provided through the Namibia Charcoal Association (NCA) as well as widely available publications (e.g., *Good Practices for Namibian Charcoal* by the NCA and *Financing Bush Control* and the *Bush Control Manual* by the De-bushing Advisory Services Namibia), and charcoal producers need to comply with specific legislation contained in the Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005 and its regulations.

3.3 CHARCOAL PRODUCTION

3.3.1. OPERATIONS OF CHARCOAL PRODUCTION

Charcoal production is still a rather young industry in Namibia, but it is already internationally recognised and well-regulated and organised. Namibia's charcoal production ranks fifth in the worldwide comparison (Namibia Charcoal Association). In Namibia, however, no forests are cut down for charcoal. Instead, savannah areas lost to encroaching bush are reclaimed. Charcoal production is, therefore, an important activity for the sustainable management of bush encroachment.

In most areas, the forestry authority mainly approves the utilization of blackthorn to produce charcoal. But specific trees and shrubs in different parts of the country are also allowed to be turned into charcoal. Charcoal is produced from solid wood of different dimensions, preferably 10 to 20 cm in diameter. In principle, all wood species are suitable for charcoal production (Joubert, 2014).

Charcoal is produced by slow pyrolysis, which is the heating of wood in the absence of oxygen. Pyrolysis, or carbonization, is initiated by heating a pile of wood under controlled conditions in a closed space such as a charcoal kiln with a limited supply of air triggering endothermic and exothermic reactions. The biomass produces, because of the pyrolysis process, a mixture of gas, liquid, and charcoal. Small steel kilns are the most common type of kilns used to produce charcoal on a small scale.

3.3.2. NEED AND DESIRABILITY OF CHARCOAL PRODUCTION

As stated previously, bush thinning is needed in Namibia to improve rangeland productivity. Through the production of charcoal and other biomasses from bush thinning, value-added is achieved whilst combatting a national challenge. The production of charcoal is one of several products that can be produced from encroacher bush that offers several advantages over other biomass products. Small scale charcoal production has the following advantages: easy transportation; limited skills for the operations; and low investment. Large scale charcoal production produces masses of the product; has less energy input; has improved throughput; and speeds up de-bushing.

Charcoal production is the most important value-added product for wood from bush thinning. According to UNIDO & MAWF (2019) between 6,000- 10,000 producers, processors, marketers, and exporters engaged in the sector in Namibia. A total of 216,669 tons was produced during the 2015/16 financial year and a total

of 109,885 tons during 2016/17. Charcoal exports to South Africa alone amounted to 139,684 tons during 2015/16 and another 71,991 tons during 2016/17. A total of 45,547 tons were exported elsewhere in 2015/16 and 14,690 tons the following year. The statistics of the MAWF also show that during the two financial years under review 31,438 tons of charcoal and 23,204 tons respectively were supplied to the local market. The charcoal industry created between 2,318 and 3,763 jobs during the past three years (MAWF).

Charcoal production is a labour-intensive process, employing many people at different phases of the process and distribution. Sustainable production of wood-based fuels (particularly charcoal) can support rural development through decentralised processing and production, short transport distances with low risks, locally available and renewable resources, and potential for short-term efficiency improvements (improved stoves, kilns etc.).

It can yield a health dividend, due to reduced levels of smoke, cleaner combustion, and easy handling. (Energypedia, 2018). In addition, charcoal stoves are more efficient than wood stoves, the ratio of primary energy to usable energy is almost the same as with fuelwood.

3.4 FOREST STEWARDSHIP COUNCIL

FSC is an independent, not for profit, non-governmental organisation dedicated to the promotion of responsible forest management worldwide. Founded in 1993, its mission is to promote environmentally appropriate, socially beneficial, and economically viable management of the world's forests. FSC operates on the ground through a network of Regional and National Offices and focal points in more than 40 countries.

FSC sets forest management standards based on 10 Principles and Criteria for responsible forest management. These Principles and Criteria are valid worldwide which filter down into national or regional forest management standards, or International Generic Indicators (IGIs), helping stakeholders and certification bodies to interpret the Principles and Criteria for a specific region or country and to bring global consistency to forest management standards.

In 2019 the first Namibian FSC standard has been approved. The National Forest Management Standard (NFSS) for the Republic of Namibia is based on Version 5 of the Forest Stewardship Council (FSC) Principles and Criteria (P&C) and have been in effect since April 2020 (FSC, 2019).
The FSC Principles & Criteria describe the essential elements or rules of environmentally appropriate, socially, beneficial, and economically viable forest management. These are listed as follows (FSC, 2020):

1. **Compliance with laws** - Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory and comply with all FSC Principles and Criteria.

2. **Workers' rights and employment conditions** - Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented, and legally established.

3. **Indigenous peoples' rights** - The legal and customary rights of indigenous peoples to own, use and manage their lands, territories, and resources shall be recognized and respected.

4. **Community relations** -Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.

5. **Benefits from the forest** -Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

6. **Environmental values and impacts** -Forest management shall maintain, conserve and restore ecosystem services and environmental values of the forest, and shall avoid, repair or mitigate negative environmental impacts.

7. **Management planning** -Forest manager shall have a management plan consistent with its policies and objectives and proportionate to scale, intensity and risks of its management activities. The management plan shall be implemented and kept up to date based on monitoring information to promote adaptive management. The associated planning and procedural documentation shall be sufficient to guide staff, inform affected stakeholders and interested stakeholders and to justify management decisions.

8. **Monitoring and assessment** - Forest manager shall demonstrate that, progress towards achieving the management objectives, the impacts of management activities and the condition of the forest, are monitored and evaluated proportionate to the scale, intensity, and risk of management activities, to implement adaptive management.

9. **High conservation values** -The forest manager shall maintain and/or enhance the High Conservation Values of the forest through applying the precautionary approach.

10. **Implementation of management activities** – Management activities conducted shall be selected and implemented with the manager's economic, environmental, and social policies and objectives and in compliance with the FSC Principles and Criteria collectively.

3.5 GROUP SCHEMES AND CERTIFICATION

Under FSC, certification can be obtained through a Group Scheme. Group certification is available to make it easier for small forest owners to become FSC certified. It enables group members to share some of the costs related to certification, thus allowing reduced cost of forest certification per FMU, as well as per hectare and annually harvested volume unit. Group certification also reduces the workload for each group member related to achieving and maintaining an FSC certificate by placing a significant part of the administrative duties on the Group Manager.

The Group Manager sets up the Group Scheme including the scheme systems (e.g., Farm Management Plan). The Group Manager takes responsibility to check the compliance of group members' activities with the FSC requirements (further responsibilities are discussed in Section 4.9.2).

FSC has provided Toolkits to support setting up and managing Group Schemes, which are available here:

- ic.fsc.org/file-download.fsc-group-certification-toolkit.14.htm

- ic.fsc.org/file-download.fsc-group-certification-toolkit-supporting-documents.15.htm

3.6 NEED, DESIRABILITY AND BENEFITS OF FSC CERTIFICATION

FSC certification sets requirements for forestry operations aiming to lower the negative impact on the environment and biodiversity, as well as to improving local communities in numerous ways from recreational use to local employment.

Certification creates transparency to the forestry operations and can be understood as a license to operate and have an active discussion with various stakeholders. FSC certification is a market-based system for ensuring the source of responsible forest-based materials. It creates an international guarantee of the origin of the materials as well as a standard for managing certified forests. FSC certification also ensures better market access for timber and in some cases can even create a price incentive or price premium for forest owners who are FSC certified.

3.7 ALTERNATIVES

3.7.1. ALTERNATIVES TO BUSH THINNING ACTIVITIES

As discussed in Section 3.2.3, bush thinning is a requirement to manage and combat bush encroachment. Through sustainable bush thinning, various benefits, from economic to social and environmental benefits can be achieved, including the resolution of bush encroachment, and thus improving rangeland productivity. Bush thinning is required to manage rangelands and bush encroachment, thus there are no alternatives to this activity.

Bush thinning practices can vary through approach e.g., tree marking system; patch harvesting system and selective multi-stem harvesting. Unsustainable or incorrect approaches to bush thinning can lead to environmental impacts such as loss of protected species, clearing of large areas leading to dust, soil erosion and loss of or disturbance to flora and fauna. Therefore, the approach to bush thinning needs to follow best practice guidance under the Forestry and Environmental Authorisation Process for Bush Harvesting Projects (MAWF & MET, 2017) and the Strategic Environmental Assessment (SAIEA, 2015). There are significant differences in benefits and adverse impacts between approaches, such as unselective and excessive bush clearing versus selective; and the application of the Tree Equivalent Formula (see (MAWF & MET, 2017) for further details.

3.7.2. ALTERNATIVES BUSH THINNING TECHNIQUES & TECHNOLOGY

Bush thinning can be undertaken through various means, including manual, mechanical, fire and chemical and biological control. Sustainable bush thinning under the FSC Group Scheme avoids the use of chemicals and fire. Chemicals would only be applied during rangeland management of fire breaks, roads, and servitudes. The bush thinning technique (manual and or mechanical) will be determined by each farm unit as each one will have different environmental conditions and one technique will not be suitable for each FMU.

3.7.3. Alternatives to Charcoal Production

Charcoaling offers an easy way to provide income from bush thinning, which supports both the bush thinning operations but also provides funds for aftercare (of the rangeland). Various alternatives to charcoal production are available, such as the production of woodchips, compressed firewood, or animal feed. The SEA report (SAIEA, 2015) provides a comparison of these alternatives, therefore will not be repeated here.

3.7.4. Alternatives To FSC Accreditation

The alternative to operating under this scheme is not operating at all or operating outside of the FSC scheme. Being certified under the FSC brings various benefits for farm units reduces adverse environmental impacts and maintains biodiversity, productivity, and ecological processes; is socially beneficial; and economically viable. Units not taking part in the FSC scheme or applying similar standards will unlikely achieve similar benefits; could potentially result in adverse impacts (environmental and social); and would not get the support from operators undertaking the same activities, thereby sharing best practice and knowledge.

3.8 Jumbo Charcoal Group Scheme

Jumbo Charcoal Group Scheme registered and received FSC certification in 2001, currently, there are 32 FMUs (as of June 2021), that undertake bush thinning and charcoal production activities for the export market following the FSC standards.

The Jumbo Group Scheme is managed by a Group Manager who takes responsibility to check the compliance of group member's activities with the FSC requirements (discussed further in Section 4). If non-compliances are identified, the Group Manager must ensure that they are followed up and corrected.

3.8.1. Farm Management Units

At the time of writing this report, 32 FMUs are registered under the Jumbo Group Scheme and one FMU is at a pre-administration level. This means that the producers have been subjected to a pre-admission audit and have been consulted on outstanding items required before the unit can be accepted into the Jumbo Group Scheme.

As discussed in Section 1.1 the number of units registered in the Group Scheme varies over time. A comprehensive register of certified (in operations and not in operations) and pre-administered units is held by the Jumbo Group Scheme Manger. The register includes unit and owner/producer name; unit location (region, town, and coordinates), total unit size; wildlife protected areas; total FSC Certified Area and Charcoal Production Area; and past and projected yields. An example is provided in Table 4 (certain information has not been presented due to commercial and private information).

All FMUs currently certified or pre-administered can be found in the central and northern regions of Namibia, see Figure 1. Potential future FMUs will also be within this area or close to it due to encroacher issues and economical and logistical aspects. The current FMU size ranges between 4,000 and 20,000ha.

As part of the FSC requirements, each FMU is obligated to produce a farm map indicating their camps, land uses, water points, unit boundaries, coordinates, and neighbouring farm details (owner name and contact details). A description of each site is a requirement under the FSC accreditation.

The FMUs located in central Namibia are within the Highland Shrubland and Thornbush Shrubland vegetation type and in the northern area, the units are in the Karstveld ecoregion, all of which are classed as the Acacia Tree and Shrub Savanna biome (Mendelsohn, 2003). The central area is approximately 1,400 – 1,600m above sea level which is dominated by Lithic Leptosols (very thin or shallow soils), EutricRegosols (fertile soils with high base saturation) and Chromic Cambisols (soils with bright colours). The north area is dominated by MollicLeptosols soils, soils with good surface structure, and is approximately 1,000m above sea level (Mendelsohn, 2003). The average annual maximum temperature in the central area is between 28°C and 32°C, and in the north is between 30°C and 34°C, with minimum temperatures being between 2°C to 6°C and 4°C to 8°C respectively. Rainfall can ranger between 300 to 350 mm per year and 450 to 500mm per year in the central region and the north respectively (Mendelsohn, 2003). Each unit is required to describe the environment that may be affected by the proposed activity.

TABLE 4: SHOWING ALL THE CURRENT FSC REGISTERED FMUs.

FMU NAME	AREA (HA)	SIZE CLASS	GEOG. COORDINATES	REGION	MAIN PRODUCTS	EXCLUDED AREA FROM FSC (HA)	WILDLIFE PROTECTION AREA	TOTAL FSC CERTIFIED AREA	CHARCOAL PRODUCTION AREA
Mooidraai No. 676 & Middelvlei No 668	11,027	>10000ha	18 58 608 21 20 530	Omaheke	Charcoal	271.43	1335	10,756	9,421
Ouhave No.242	6,816	>1000-10000ha	18 36 921 21 25 805	Omaheke	Charcoal	657.1	689	6,159	5,470
Okakango Nord No. 58 / Okamita No 59	20261	>10000ha	16 31 725 21 57 064	Otjozondjupa	Charcoal	293	3049.9	19,968	16,918
Ongeama (Osona No.65, Ongombeomuriu No. 56)	7,829	>1000-10000ha	22 03 47 16 51 28	Otjozondjupa	Charcoal	5.89	1316.07	7,823	6,507
Mombolo No. 392	8,896	>1000-10000ha	21 33 57 18 33 49	Omaheke	Charcoal	143.6	902	8,752	7,850
Westfalenhof No 23	14278	>10000ha	22 10 12.3 16 25 18.3	Otjozondjupa	Charcoal	1265.9	1652.2	13,012	11,360
Otjombuindja No. 33	20095	>10000ha	21 37 59.9 16 29 31.3	Otjozondjupa	Charcoal	223	4843.5	19,872	15,029

FMU NAME	AREA (HA)	SIZE CLASS	GEOG. COORDINATES	REGION	MAIN PRODUCTS	EXCLUDED AREA FROM FSC (HA)	WILDLIFE PROTECTION AREA	TOTAL FSC CERTIFIED AREA	CHARCOAL PRODUCTION AREA
Okauhapehuri No.19	5396	>1000-10000ha	21 48 816 16 29 851	Otjozondjupa	Charcoal	874.9	1514.35	4,521	3,007
Otjikuoko East & West No 82 & 83	9843	>1000-10000ha	21 47 25 17 14 42	Otjozondjupa	Charcoal	223.3	1583.4	9,620	8,036
Okamapu 104, Okakango Berg 187	8611	>1000-10000ha	21 45 2 16 40 44 & 21 33 15.78 16 41 56.48	Otjozondjupa	Charcoal	613.46	2474.37	7,998	5,523
Okamatangara No 280	12573.76	>10000ha	21 02 106 18 16 616	Otjozondjupa	Charcoal	574	1159	12,000	10,841
Moringa (Bergveiher No 19, Ovihakondua No 32, Leopardklippe No 32)	9917.89	>1000-10000ha	21 44 14 16 26 37	Otjozondjupa	Charcoal	403.6	1557.2	9,514	7,957
Harmonie No 225 & Alfa 226	9282.91	>1000-10000ha	21 34 11.72 17 23 36.31	Otjozondjupa	Charcoal	1332.5	689.81	7,950	7,261
Otjimbuku No 136 & Otjoruharui No	11085	>10000ha	21 15 6.40 17 3 11.84	Otjozondjupa	Charcoal	936.86	1551.3	10,148	8,597

FMU NAME	AREA (HA)	SIZE CLASS	GEOG. COORDINATES	REGION	MAIN PRODUCTS	EXCLUDED AREA FROM FSC (HA)	WILDLIFE PROTECTION AREA	TOTAL FSC CERTIFIED AREA	CHARCOAL PRODUCTION AREA
251									
Okamahoro No 140	5398	>1000-10000ha	22 6 57.09 16 32 3.19	Otjozondjupa	Charcoal	2175.06	641.3	3,223	2,582
Claratal No 18	16348	>10000ha	22 47 46.73 16 50 37.48	Otjozondjupa	Charcoal	2	5989	16,346	10,357
Omatozu No 42	5872	>1000-10000ha	21 44 33 16 50 26	Otjozondjupa	Charcoal	0	700	5,872	5,172
Geduld No 300	6997	>1000-10000ha	21 45 27 17 48 37	Otjozondjupa	Charcoal	98.3	2427	6,899	4,472
Spytfontein No 252, Maitland No 538	8303	>1000-10000ha	21 18 54 17 41 26	Otjozondjupa	Charcoal	356.5	855	7,947	7,092
Otjiruze (Otjiruze No 79, Eundo No 75, Scheukswerder 76, Achalm No 583, Elephantenberg No 584)	25340.53	>10000ha	21 46 21 17 21 28	Otjozondjupa	Charcoal	2158.5	3211.61	23,182	19,970
Okamahapu 142	4041.82	>1000-10000ha	21 30 43 17 41 52	Otjozondjupa	Charcoal	910	555	3,132	2,577

FMU NAME	AREA (HA)	SIZE CLASS	GEOG. COORDINATES	REGION	MAIN PRODUCTS	EXCLUDED AREA FROM FSC (HA)	WILDLIFE PROTECTION AREA	TOTAL FSC CERTIFIED AREA	CHARCOAL PRODUCTION AREA
Troye 253	2864.7	>1000-10000ha	21 14 12 17 45 25	Otjozondjupa	Charcoal	95.7	294	2,769	2,475
Kaizen 2005	5459.4	>1000-10000ha	21 34 47 18 27 9	Otjozondjupa	Charcoal	414.6	634.25	5,045	4,411
Serena 221	2500	>1000-10000ha	21 25 32 17 29 26	Otjozondjupa	Charcoal	28.4	314.7	2,472	2,157
Otjikuara No. 151	2236	>1000-10000ha	21 37 17 17 35 26	Otjozondjupa	Charcoal	1.26	232	2,235	2,003
Alarona 304	3462	>1000-10000ha	21 32 40 17 22 34	Otjozondjupa	Charcoal	89	470.7	3,373	2,902
AgriSchoenau Trading CC (Goeiehoop 491 A&B)	4072	>1000-10000ha	22 54 57 19 15 37	Omaheke	Charcoal	72.4	462	4,000	3,538
Okovikenga No 206	4740	>1000-10000ha	22 54 57 19 15 37	Otjozondjupa	Charcoal	88.01	563	4,652	4,089
Ozombusomasse 174,Bag-Bag 180, Vredelus 257, Frederiksrux 159	10738.229	>10000ha	21 29 26 16 29 29	Otjozondjupa	Charcoal	451.25	508	10,287	9,779

FMU NAME	AREA (HA)	SIZE CLASS	GEOG. COORDINATES	REGION	MAIN PRODUCTS	EXCLUDED AREA FROM FSC (HA)	WILDLIFE PROTECTION AREA	TOTAL FSC CERTIFIED AREA	CHARCOAL PRODUCTION AREA
Okanjete 208	4920	>1000-10000ha	21 16 03 17 15 25	Otjozondjupa	Charcoal	900	585	4,020	3,435
Karo Enterprises CC No 344 (Otjikaru 27, Okombahe 16)	6330.8112	>1000-10000ha		Otjozondjupa	Charcoal	0	1163.9	6330.81	5166.911

4 ENVIRONMENTAL MANAGEMENT FRAMEWORK

4.1 JUMBO GROUP SCHEME TOOLKITS

Various toolkits have been developed to ensure that the management of FMUs can be as efficient as possible and that each FMU is compliant regarding best practices, national legislation and international standards (i.e.., FSC). The Toolkits that are used for the management of Jumbo Charcoal FMUs include the following:

- Electronic auditor software, which makes up the FMP and has been developed based on the generic EMP and the 10 FSC principles (Appendix B).
- CARs and monitoring forms (part of the FMP)
- A7 register, containing member information, all FMUs, allowable charcoal use, open market information and Mapping calculations (Table 4).
- Google Earth – mapping (FSC mapping requirements can be seen in Appendix B)
- Biomass quantification – TE system (Appendix B)
- FMP excel document containing the greater stakeholder register, Risk Assessment, FMU Annual budget, species lists, farm rules, harvesting plan, legal register.
- Pesticides Toolkit - Standard Operating Procedures, checklist and Environmental and Social Risk Assessment (ESRAs) for active ingredients used.
- Policy and Procedure Manual – Documents including all policies and standard operating procedures.
- Memorandum of Agreement – an agreement between Group Scheme Member and Group Scheme

These Toolkits have been adapted for use in Namibia and incorporate the guidelines to comply with regulations governing bush thinning and value addition projects. It comprises of several policies, guidance, checklists, and forms that together form part of the Farm Management Plan. Each FMU within the Group Scheme is required to follow these toolkits and produce the mandatory documents (proof added to the FMP) to become certified and export charcoal through Jumbo Charcoal.

4.2 NEW & EXISTING MEMBERS

A Group Scheme is open to all candidates; however, it is important to ensure that the Group Scheme has sufficient resources and that the Group Scheme Manager can manage the extended group and that the candidate's forestry practices are following FSC principles. Before a member can join a group, the Group Manager evaluates their management practices against FSC standards using a checklist (Membership form including membership requirements, pre-admission checklist and a pre-admission inspection form).

If the candidate is well prepared for certification and the initial audit did not identify major non-conformances with FSC Standards, various steps then follow. Key documents that must be produced by

each new member (new FMU) for the application for the Group Scheme membership are as follows (also important for existing members to update and provide these relevant documents):

- Rapid environmental impact assessment report – which includes unit site description, the environment that may be affected and any additional impacts specific to the unit;
- Farm Management Plan (FMP) – based on the generic EMP presented in Section 4.4, includes farm map, size of the area to be thinned and harvesting system, expected duration of the project, species to be thinned, the approximate density of trees to remain after thinning, methods of bush thinning, equipment and machinery, number of staff to be employed and where they would live (as required in the Forestry and Environmental Authorisation Process for Bush Harvesting Projects (MAWF & MET 2017));
- Harvesting plan (part of the FMP excel document), providing details of the planned and actual yield per camp as well as the aftercare measures;
- Short/medium/long-term objective plan; Annual Jumbo supply agreement; I&AP list and completed social impact assessment letter and responses;
- High conservation value area (HCVA) assessment;
- TE counts veld monitoring sheet;
- Bush Thinning excel model;
- A7 register;
- Annual charcoal budget; and
- Basic veld fire plan.
- Harvesters training guide

These Toolkits provides all relevant documentation and guidance for each FMU to aid with the application process and ensure compliance. In Figure 5 the organisational structure of the Jumbo Charcoal group Scheme can be seen.

4.2.1. Maintenance of Members

To maintain membership and be compliant with the FSC and thus remain within the Group Scheme, each FMU is required to submit various documentation to the Group Manager at specific intervals throughout the year. These include, but are not limited to (most of the below-required documents/information is recorded in the FMP/electronic auditor software):

- Comply with quarterly farm inspections/audits and annual FSC external inspections/audits;
- Up to date EMP;
- Up to date I&AP list;
- Training register;
- Accident/incident register;
- Grievance register;
- Chemical register (if applicable);

- An annual report documenting completed forest operations and sales information;
- Updated mapping information;
- Update the FMP
- Signed Workers Contracts; and
- Veld assessment form (tree equivalent assessment).

The Jumbo Toolkits (Appendix B) provides all relevant documentation and guidance for each FMU to ensure compliance is achieved, as well as specific time frames as to when each requirement needs to be submitted (as they may vary from every 3 months to every 5 years). By complying with the FSC standards and through the delivery of these documents, the requirements under the Environmental Management Act and associated regulations are complied with. If the requirements are not met, then the FMU would not be registered under the Group Scheme and thus would not have a valid environmental clearance certificate allowing them to operate.

4.2.2. AUDITING

Before a new member can join the Group Scheme, the Group Manager undertakes an informal audit to determine if the FMU meets FSC standards and that non-conformance can be suitably resolved. Once a member joins the Group Scheme, internal quarterly auditing shall be undertaken by the Group Manager. Through this internal audit, the International General Indicators are used to assess compliance. An inspection report is completed by the Group Manager, and where non-conformance or corrective action is identified, these actions are registered within the FMP.

In addition, every year, the FSC Certification Body performs annual audits to ensure forest management practices continue to meet the requirements set out in the International General Indicators. A report is produced by the Certification Body and issues to the Unit Manager and Group Manager for action.

4.2.3. UNIT MANAGER

The Unit Manager (the producer) is accountable for the FMU and compliance to FSC standards and tends to be the owner of the farm. They will be available, as required, throughout the operations of the project to all FMU employees and the Group Manager. The Unit Manager will be responsible for the following:

- Complete all Jumbo Group Scheme documentation and read through all policies and guidelines;
- Create a farm map indicating unit boundaries, neighbouring details, boreholes, camps, and important features;
- Complete and file all required documents in the Toolkits, including but not limited to:
    - Rapid environmental impact assessment report
    - FMP
    - Camp based harvesting plan
    - Short/medium/long-term objective plan
    - Annual Jumbo supply agreement
    - social impact assessment letters

- HCVs assessment report
- Stem per hectare assessment report
- Annual charcoal budget
- Basic veld fire plan

- Maintain and file
  - Training register
  - Accident/incident register
  - Grievance register
  - Chemical register (if applicable)
  - Signed Workers Contracts
  - Veld assessment form (tree equivalent assessment)
- Ensure there is always a certified first aid trainer and first aid kit on site
- Ensure that the workers' accommodation meets the Group Scheme standards
- Comply with all FSC Principles and Group Scheme Policies and requirements

4.2.4. ROLES AND RESPONSIBILITIES

TABLE 5: ROLES AND RESPONSIBILITIES WITHIN THE GROUP SCHEME

ROLE	RESPONSIBILITIES
Group scheme owner	– Provide advice and support to the group manager and group members relating to forest management according to FSC principles
Group manager	– Manage the process for new members. – Manage all members of the group scheme by following FSC standards and legal obligations. – Provide group members with advice, help and necessary information to help them maintain compliance with all FSC principles and criteria. – Undertake internal audits and identify any non-conformance and raise a CAR, manage the CAR register and follow up all CARs within the specified time frame. – Support external audits with FSC. – Manage all group scheme documentation and revise as and when necessary, issuing to all group members. – Coordinate internal and external communications. – Be accountable for the implementation of the policies across all units under the group scheme.
Unit manager/group member	– Manage FMUs by following the group scheme standards, FSC standards, national and internal legal requirements. – Follow all group scheme processes and procedures, and complete all of the prescribed documentation set out in the group scheme management system. – Fully participate in all internal and external audits. – Raise any non-conformance and corrective actions to the group manager.

ROLE	RESPONSIBILITIES
	– Responsible for maintaining compliance. Any non-conformance shall result in corrective action and potentially expulsion from the group scheme.
Unit employees	– To operate in accordance with the standards, processes and procedures set out in the FMP workbook and PPPS Manual. – Any non-conformance shall result in corrective action, penalties and potentially termination of employment.

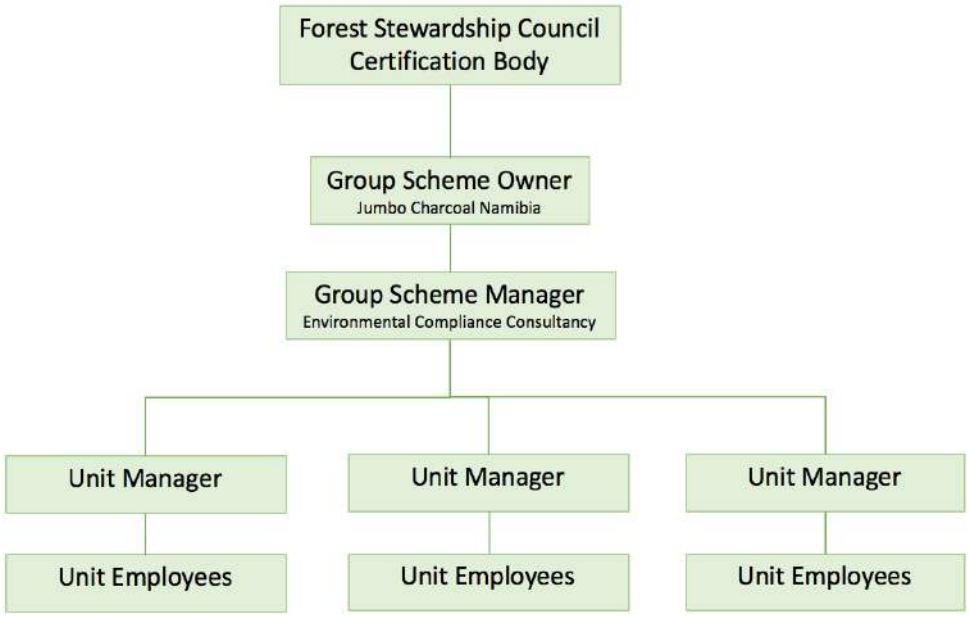


Figure 5: ORGANISATIONAL STRUCTURE OF THE JUMBO GROUP SCHEME

4.3 FSC Reporting and Compliance Requirements

A Group Scheme certificate is valid for five years providing compliance is maintained. The Group Manager must undertake the following to remain compliant:

- Provide a sales summary periodically, collating each group member (FMU) and entire group entity (Group Scheme);
- Provide up to date data of members;
- Present annual summary reports of the findings of internal audits/checks or other means of internal verification of continuous compliance are implemented;
- All non-compliances are addressed properly by issuing corrective action requests to group members and ensuring they are adequately dealt with; and
- The selected certification body checks compliance with FSC requirements once every year with a special view on monitoring & evaluation according to group procedures.

A group non-compliance may be caused by:

- The Group Manager not fulfilling his/her management responsibilities. For example, the group members might not be informed sufficiently, or there is a lack of information, coordination and planning on the group level, or the group manager might lack required documentation and information about group members' activities etc.
- The non-compliance of the Group Manager to ensure that all its members comply with the conditions and corrective actions issued by the certification body
- The Group Manager not dealing with the small non-conformances and misunderstandings among the group members. This can happen if the Group Manager lacks control over the supervision of group members' activities.

A member non-compliance may be caused by:

- The failure of an individual group member to comply with certain FSC criteria or indicators. This, in turn, might result from the Group Manager being unable to provide clear guidance on FSC requirements or guide the group member's attention towards possible non-conformance to quickly correct/prevent the non-conformance.

4.3.1. Corrective Action Request Register

The Group Manager for the Jumbo Group Scheme has set up a CAR system within the electronic auditor software (makes up the FMP) to collate all non-compliance and recommendations. It provides a tool to collectively manage Unit Managers and operations at each FMU. It is presented to the FSC auditor annually.

During FMU audits (quarterly and annually), non-compliance or recommendations are raised as a CAR. The severity of a CAR can vary from observation to a minor (12 months to resolve) to Major (3 months to resolve). Each FMUs farm management plan holds the relevant corrective action items, that should be updated, improved or corrected.

4.3.2. Monitoring Requirements

Monitoring after bush thinning is essential and thus a requirement under the Jumbo Group Scheme. It is the responsibility of the Unit Manager to ensure monitoring is undertaken and therefore is included in the annual audit undertaken by the FSC Certification Body. Since bush thinning is expected to improve the ecological integrity of rangelands, general indicators such as the population status of predators can illustrate ecosystem health. In addition, a sustainable increase in the number of the game utilizing in the camp/area would be a useful indicator. The method used to monitor each farm unit shall be included in the Policy and Procedure Manual and or FMP. Monitoring reports shall be inspected as part of internal and external auditing.

4.3.3. Training Requirements

It is the responsibility of each FMU to ensure that all personnel have a basic level of environmental and safety awareness training, and that training is undertaken regularly. Training shall also be provided in the form of toolbox talks by the Unit Manager.

All training shall be recorded with names of personnel, date of training and required renewal dates, the group manager with review these registers during each FMUs audit.

Each FMU should also have an individual with a valid first-aid certificate. To maintain compliance with this requirement, Jumbo arranges first aid training annually for all the Group Scheme Members.

4.4 GENERIC ENVIRONMENTAL MANAGEMENT PLAN

In line with the Strategic Environmental Assessment of Large–Scale Bush Thinning and Value–Addition Activities in Namibia (SAIEA, 2015) and the Forestry and Environmental Authorisation Process for Bush Harvesting Projects (MAWF & MET, 2017), a farm or cluster of farms in the same area can modify the generic EMP. As discussed in Sections 3.8 and 4.2, each FMU shall provide specific information to become certified and maintain certification. An amended EMP is part of these requirements.

The Generic EMP deals with most of the impacts that need to be managed, irrespective of where an FMU is located. However, as discussed, no two FMUs are identical, so this Generic EMP shall be customised for each unit. The Unit Manager must study the generic EMP, delete those actions that are not relevant to his/her FMU, modify those actions that need fine-tuning, or even add relevant new actions. It is not acceptable to just adopt this Generic EMP as it stands.

The Generic EMP covers the following:

- Health and Safety
- Disturbance of Wildlife and Livestock
- Damage to Plants and Rangelands
- Soil Erosion
- Pollution of Groundwater
- Pollution of Air
- Prevention of Regrowth through Aftercare

The Generic EMP presented in this Chapter in addition to the forms, policies and guidelines presented in Appendix B (Toolkits), collectively form the Group Scheme Management Plan.

4.5 MANAGEMENT PRINCIPALS

The following principles are summarised from guidelines for bush harvesting set out by the FSC, Joubert & Zimmerman (2002), De Klerk (2004) and others, and should be applied to all units.

4.5.1. BUSH THINNING

Jumbo has identified three silviculture systems that each farm unit should choose from when undertaking bush thinning, which suits their requirements and management style. Different systems can be used in different camps within each unit if this is identified in the LTM Plan. These systems are based on the following harvesting principles, as per the SEA (SAIEA, 2015):

- As a rough guide, the ‘tree-equivalents’ (TEs) per hectare that remain after harvesting should be roughly 1.5 to 2 times the average annual rainfall. (A ‘tree-equivalent’ is a 1.5m single-stemmed tree, so a 3m tall tree would equal 2 tree-equivalents). For example, in an area where the average annual rainfall is 400 mm, there should be 600 - 800 tree-equivalents per hectare. In areas of sandy soils, such as the Kalahari sandveld, the tree-equivalents should be higher, at about three times the average annual rainfall. This ‘rule of thumb’ is applicable in the areas where annual average rainfall

is 150 – 500 mm and covers most of the areas in Namibia where there is severe bush encroachment.

- In areas with average rainfall greater than 450 mm, which includes most of Namibia's woodland habitat, the density should be not less than 3 times the average annual rainfall.
- Evergreen trees protected species and riverine species should not be harvested.
- It is illegal to harvest trees in riverbeds and watercourses and within 100 m of them. Riverine vegetation forms an important habitat for fauna, and the roots stabilize the soil which helps to reduce erosion.
- Twigs, leaves and fines should be left where trees are felled. They create mulch which improves soil moisture, provide soil organic matter, and increase soil nutrient levels. Relatively larger dead trees should not be harvested. They provide cavities for hole-nesting birds and perches for raptors.
- Maintain spatial heterogeneity i.e., leave patches of dense bush, and retain a variety of size classes.
- Tree thinning improves the quality of pasture, but total clearing lowers it. Bush thinning should not try to create a homogeneous environment – rather make it patchy, to create a mosaic effect.

4.5.2. Charcoal Production Mitigation

The following management principles shall be applied to all units under the Jumbo Group Scheme:

- Kilns should be operated efficiently so that there is truly little smoke. Kiln operators should be trained in the correct packing of the kilns.
- Retort kilns are known to be more efficient in that they produce less smoke. This alternative charcoal-making apparatus should be considered for charcoal production operations.
- Scrubbers should be installed in factory chimneys to minimise air emissions.

4.6 Generic Environmental Management Plan

As stated previously, the generic EMP must be reviewed and amended by each Unit Manager and submitted to the Group Manager on an annual basis as part of auditing requirements. All of the important aspects mentioned in the Generic EMP are recorded and updated for each FMU in their FMP.

The following details shall be provided by each FMU as part of their EMP. This information is a requirement of the FSC Standards, the MEFT best practice requirements for bush harvesting projects (MAWF & MET, 2017), and a requirement under the EIA Regulations and the FMP:

TABLE 6: REQUIREMENTS UNDER EIA REGULATIONS.

Description	Requirements
Location and Environment	– Name of the farm(s) / land where the project is located. If known, GPS coordinates should also be provided. – The legal status of the land. – Description of current use of the land, including livestock numbers, water points, camps etc.

Description	Requirements
	– Name and contact details of farmer/land custodian/manager. – Name and contact details of immediate neighbouring farmers/land custodians/managers. – Photos of relevant permits – Farm size on the Title deed – Biophysical Information – Description of the general ecology of the land (e.g., topography, soil type, flora, fauna). – Description of the bush encroachment problem on the land: o Tree species causing problems. o At least 3 density estimates for the area to be thinned. – Description of past efforts to manage the bush encroachment problem on the land. – Biodiversity information ie., High Conservation Values (HCVs) – Harvesting information (WPA, totally excluded area, charcoal production area etc.)
Description of the Bush Thinning Project	– Size of area to be thinned. – Expected duration of the project (years). – Species to be thinned. – Maximum Allowance – SLIMF/Non-SLIMF – Approximate density of trees to remain after thinning. – Methods of bush thinning to be used. – Equipment/machinery/chemicals to be used. – The number of staff to be employed. – Worker details (Remuneration, Social Security, Children, living conditions etc.) – Charcoal delivery notes and invoices – Relevant permits – How staff will be recruited. – Where staff will live. – What contractual arrangements will be made with staff. – The volume of FSC charcoal produced per year.

Description	Requirements
Description of the Bush Value-Adding Project	– Expected duration of the project. – Products to be produced (description, quantity). – Size of the area where the value addition project will be located. – Methods of production to be used. – Equipment to be used. – What liquid or solid waste will be generated (type and quantity). – Where the waste will be disposed of. – Where the water will come from. – How much water will be used – What air emissions will be generated. – How the product will be taken to market. – Who and where the off-taker/market is. – Where staff will live. – What contractual arrangements will be made with the staff.
Additional Information	– Farm map (can be Google Earth image showing farm boundaries). – Photos of bush encroached areas. – Any other information that further describes the project. – Factory Records – Emergency contact details – Fire, Chemicals, Fuel, Waste and Machinery use information – Events and accidents – Training records – Heritage – Other relevant photos/documents

TABLE 7 – POTENTIAL ENVIRONMENTAL IMPACTS, MANAGEMENT AND MITIGATION MEASURES

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
Health and Safety	HIV/AIDS infection due to risky sexual behaviour	– Provide awareness information to workers – Do not allow visitors to the project area – Provide free condoms – Provide recreation facilities (games/TV etc.)	Daily	Site manager/Safety officer
	Bites/stings from snakes, scorpions and insects	– Staff may not catch or kill snakes or scorpions – Staff must wear protective glasses, gloves, closed shoes, hard hat and overalls while working – A first aid kit, which includes an aspivenin pump, must be accessible for all staff – Accommodation/eating areas kept clean at all times, garbage placed in closed containers to avoid attracting vermin, insects	Daily	All Staff
	Harm to face, eyes, skin and other parts of the body from thorns, dust, etc.	– Staff must wear protective glasses, gloves, closed shoes, hard hat and overalls while working	Daily	All Staff
	Loss of life/injury from traffic accidents	– Vehicles roadworthy and properly maintained – Drivers comply with all Roads Ordinances, including avoiding overloading, speeding, safety belts, yellow line driving – Vehicles travel with lights on whether using tar or gravel roads – No driving at night – No conveying of hitch-hikers or non-project staff – Instruction in road safety must be given and repeated periodically amongst all drivers	Daily	All Staff

	Loss of life/injury from machinery accidents	– Machines properly maintained – Operators know and comply with machine instruction manuals – Instruction in machine operating safety must be given periodically to operators	Daily	All Staff
	Loss of life/injury from fire accidents	– Fire-fighting equipment (rubber beaters and/or backpack spray) must be accessible at key points during the controlled burning – Deploy beaters/backpack spray immediately when a fire starts – A fire cart must be available at each work station with a water supply and pumps to deal with fire – Regular training for site staff on fire prevention and control, especially in the dry season – If a fire starts, notify the farm owner/ manager immediately – Open fires only permitted in a designated facility at the site camp. Campfire must be extinguished when staff go to bed or leave the camp – No cigarette butts, matches or any other burning object may be thrown into the veld – An area of at least 3 metres must be cleared of grass around active charcoal kilns – Combustible refuse must be burnt in a drum. An area of 3 metres must be cleared of grass around such a drum. The drum may not be left unattended until the fire is extinguished and a lid has been – placed on the drum	Daily	All Staff
Manual and semi-mechanised bush control activities	Loss of protected species	– Avoid cutting protected trees (See Appendix A) – Protected trees must be marked (e.g. with hazard tape) and all staff should be made aware that marked trees are out of bounds. – All staff must be informed in writing about the consequences of breaking this rule, and it must be clear that the rule is understood.	Daily	All staff

	Loss of large, dead and evergreen trees	– Trees taller than 4 m, or greater than 18 cm diameter at the base, must be retained. (If the vegetation consists entirely of encroachers larger than 4 m, leave 300 – 500 per hectare.) – Evergreen trees must be retained. – Dead trees must be retained	Daily	All staff
	Loss of riverine vegetation	– No living tree, bush or shrub within 100 m of a drainage line shall be removed	Daily	All staff
	Imbalance of ecology due to over-harvesting	– Leave a heterogeneous mix of trees and bush species of different size classes ('islands') totalling at least 10% of the target area and spaced so that there are some open patches and some dense patches, to provide a variety of habitats for animals. – Seek to create an environment with a matrix of grass, large trees and bush. (The TE-formula includes all sizes and species, including protected species. The outcome after bush control activities should be a park-like landscape, with some bushy 'islands'. Areas larger than 1 hectare as representative samples of the original habitat should be left as well.)	Daily	All staff
	Disturbance of sensitive plant habitats	– Ensure that there are no bush control activities in sensitive habitats – Identify sensitive habitats before bush control activities (e.g. riverine vegetation, termite mounds, presence of nests, residing and slow-moving organisms) – Avoid harvesting on steep slopes where characteristic species dominate	Daily	All staff
	Loss of livestock and wildlife from poaching	– The killing of livestock or wildlife, and setting of snares, is strictly prohibited. Any person involved in such practices will be fired with immediate effect. – No person shall be in possession of a firearm or snare, such items should be confiscated if detected. A warning will be issued to the offender. – All personnel must be informed in writing about the consequences of breaking these rules and ensure that the rules are clear and well understood.	Daily	All staff

	Loss of livestock or wildlife because of fire	– Regular training of staff on fire prevention and fire-fighting – Fire management should be carefully planned – no burning during windy conditions, no fire in areas without firebreaks, early notification of neighbours, remove livestock from areas marked for burning, ensure escape routes, etc. – Keep fire-fighting equipment (e.g. beaters, backpack sprays, water carts with pumps, etc.) available – Implement an early warning system to take care of fires urgently – Open fires only permitted in designated areas – Clear areas (minimum of 3 m) around active kilns – No fire or burning kiln will be left unattended – Monitor areas with kilns and areas after a burn to prevent the re-occurrence of fires	Daily	All staff
	Escape of livestock or wildlife due to damaged fences and/or gates left open	– Ensure that the fences around the farm boundaries are well maintained and not damaged. – Ensure that the farm gates are always closed – The importance of these should be made clear to all staff and ensure that they are informed in writing about the consequences of breaking the rules.	Daily	All staff
	Disturbance of sensitive animals and birds	– Nests of large raptors such as eagles and vultures must be avoided by at least 100 m. In an event where such nests are found, the clump of vegetation around them should not be harvested. – Do not harm or disturb slow-moving and reside species (e.g. tortoises and snakes).	Daily	All staff
	Loss of topsoil	– No bush on slopes steeper than 12.5% should be cut (i.e. 1-in-8). – Bush cutting is also not recommended on slopes of 5 – 12.5% (i.e. between 1-in-20 and 1-in-8). – Machinery should always move along the contours, not directly up and down on slopes of 5 – 12.5%. – Should the slopes be significantly encroached, set aside as part of the 50% of bush encroached areas per farm that will not be cut in the medium to long term.	Daily	All staff

	Erosion of riverbanks	– Cutting off any living trees, bushes or shrubs within 100 m of a watercourse, pan or spring is prohibited except: 1) Where bush has encroached into seasonal pans, one may clear the floor of the pan but not around the outside margins. 2) Alien invasive species such as *Prosopis* may be removed from within a watercourse and from riverbanks.	Daily	Employees
	Loss of soil fertility	– Invaders on soil susceptible to wind and water erosion should be thinned less vigorously (e.g. sandy soils without structure and thin, shallow soils like leptosols) – All sites should be harvested according to the TE – rainfall formula to reduce the potential of exposing the soil to erosion (Appendix B).	Daily	Employees
Indirect impacts because of bush control activities	Pollution of water	– Spillages and leaks of hydrocarbons need to be contained where possible and clean-up measures should be applied immediately after such incidents. – Good maintenance and servicing should be in place to avoid breakdowns. – Waste disposal should be away from water bodies and contained if possible.	Daily	Employees
	Air pollution	– Smoke from kilns, under certain conditions, can accumulate to harmful levels. – Training and supervision of employees, as well as the use of retort kilns, can improve the efficiency of the burning process. – Good maintenance and servicing of vehicles, machinery and equipment that emit smoke can reduce their smoke potential	Daily	Employees
Aftercare activities	Increased encroachment after bush thinning	– For some species, it may be sufficient to apply methods such as hand application of herbicides or stem burning. – Ensure inspection/monitoring routine of bush density in previously harvested areas. – Aftercare is essential to prevent re-infestation. – Practising a shorter rotation time for bush harvesting may be necessary.	Weekly / Monthly	All staff

	The killing of non-target trees and other effects of arboricides	The use of arboricides has implications for human and environmental health, therefore it is essential to use them correctly. – Only prescribed herbicides for bush control may be used. – Always read the Material Safety Data Sheet (MSDS) and follow the instructions of the manufacturer on how the chemical should be stored, disposed of as well as the safety requirements. – Ensure appropriate Personal Protective Equipment (PPE) are worn when applying arboricides. – If the chemical requires mixing, this should be done in a place that is far away from non-target vegetation. – Application equipment should be properly calibrated, for dosages to be accurately applied. – Never wash spilled residues down a sewer system or clean and wash equipment near open bodies of water or boreholes – Ensure strict monitoring and management during application for chemicals not to be thrown away or sold. – It is advisable to conduct further research to calculate minimum dosages that achieve the desired effect	Daily	All staff
Job creation, skills development and business opportunities	Beneficial socio-economic impacts on a local and regional scale	– Maximise local employment and local business opportunities. – Enhance the use of local labour and local skills as far as reasonably possible – Goods and services are sourced from the local and regional economy as far as reasonably possible	Monthly	Farmer / Farm manager or appointed supervisor

4.7 ADHERENCE TO THE MAIN PRINCIPLES OF BUSH CONTROL ACTIVITIES

The *Strategic environmental assessment of large-scale bush thinning and value-addition activities in Namibia* (SAIEA, 2015) Strongly recommends that "bush farming" (re-growth of encroaching species for the purpose of re-harvesting) should not be encouraged because this approach inhibits the repair of the water cycle, will not improve soil fertility, optimal biodiversity will not be achieved, and overall rangeland productivity is less likely. Bush farming will not allow the process of ecological succession to proceed to a climax state and is also contrary to the objectives of the Forestry Act and the Rangeland Management Policy and Strategy. Instead, an approach of bush-thinning is preferred so that the landscape ecology can recover, a broad range of ecosystem services can be delivered on a sustainable basis (groundwater recharge, soil health, habitats for biodiversity) and the overall land productivity improve.

The Bush Control Manual (2017) sets the main principles for bush control in Namibia:

- *Concentrate bush control on species and individuals that are obviously part of encroacher growth and leave the others alone.*
- *Leave a mix of trees and bushes on the land: The veld should have a variety of tree species (including some of the encroacher species) of different sizes. They should be spaced in a way that there are some open patches and some dense patches. This provides a variety of habitats for animals and imitates the heterogeneity (patchiness) of natural landscapes.*
- *Thin bush in a phased approach: Avoid to "shock" the land by an abrupt change from dense bush to open veld.*
- *Protected plants should not be harvested. Exceptions can be made under the supervision of Forestry officials in cases of high densities.*
- *If arboricides are being used, foliar (leaf spray) and stem-applied arboricides are recommended. Pellets should not be used, as they tend to get washed along the surface by rain and end up in non-target areas.*
- *Dry river beds tend to carry more and larger trees. Forestry regulations state that trees should not be thinned within 100 metres of a river course. Thinning is required in densely encroached river margins, but one should leave a higher density of trees than on the adjacent habitat. It is especially important to leave large trees along a river course. The exception to this is Prosopis, an exotic species that invades riverbeds, and should be eradicated.*
- *Training of the workforce is necessary before harvesting starts. Workers need to know which trees to target and which to avoid. Work teams need to be managed so that any excessive harvesting or killing of the wrong species is noticed and corrected.*

4.8 ADHERENCE TO THE MAIN PRINCIPLES OF AFTERCARE ACTIVITIES

Aftercare is as important as bush thinning itself and an essential step to eventually restore the productivity of rangelands. Several studies and extensive research and review conform aftercare as the essential final component of a comprehensive bush control program (SAIEA, 2015). In short, aftercare is necessary to

facilitate the process of ecological succession of savanna grasslands towards a climax state – i.e., dominated by perennial grasses and sufficient woody plants.

The natural response after bush clearing is the growing of more woody replacements. If bush control activities are more selective and the encroachers thinned less radically, larger individuals suppress smaller ones and fewer follow-up removals of unwanted species are required. The timing of aftercare intervention, the duration of an aftercare program and the type of aftercare activities differ from area to area. Monitoring is thus essential – to keep control over coppicing and the emergence of seedlings. Coppicing occurs quickly on stumps that were not killed during harvesting. The emergence of seedlings depends on water supply and is tightly coupled to the rainy season.

Part of all aftercare programs is the removal of small, immature woody plants – mainly low coppice growth and saplings – to return the rangeland to the bush density achieved after the initial bush control activities (Bush Control Manual, 2017). Non-chemical methods are preferred because most of the small bush and saplings can be manually removed (e.g. chopping them off below ground level). Introducing browsers like goats on bush-controlled areas can keep sprouting and the emergence of seedlings under control, in addition. Controlled burning to kill off immature plants and saplings is another way to keep bush-controlled areas in check. Chemical aftercare is normally the last option of aftercare.

4.9 ADHERENCE TO SUSTAINABLE RANGELAND MANAGEMENT

Namibia's National Rangeland Management Policy and Strategy of 2012 emphasises eight widely applicable principles of sound rangeland management:

- Know the resource base: For any land manager, it is essential to know which perennial grass species and which woody species dominate, to know the soil characteristics, differences, and conditions, to know nutrient hotspots and to understand the general rangeland ecology to be able to evaluate the condition of the rangeland – whether it degrades, stabilizes, or improves.
- Manage grasses for effective recovery and rest: Perennial and preferred grasses are usually grazed first and most intensely, by most animals. Adaptive grazing management should be practised – to allow recovery and seeding.
- Manage for effective utilization of grasses and shrubs: On savanna rangelands, browsing is often neglected, while the herbaceous (grassy) component is often over-utilized. For this reason, browser-based livestock enterprises are encouraged.
- Enhance soil conditions: Healthier soil conditions allow healthier grass cover. In short, it means that the topsoil must be in a good condition – allowing water to infiltrate easily, containing nutrients, and preventing that the soil leach out. A good vegetation cover, in turn, provides the soil with dead matter and prevents water and wind erosion.
- Control bush encroachment: When the woody component outcompetes the herbaceous (grassy) component, the grazing potential of rangelands diminishes resulting in knock-on effects such as less biodiversity and disturbance of the water cycle.
- Plan for droughts: Timeous reduction of livestock numbers prevent fodder deficits. The availability of fodder fluctuates per season, and it is simply wise to compile a fodder bank in times of surplus.
- Monitor the resource base: good decisions about rangeland management are based on good information, and record-keeping is an essential requirement in this regard.

- Plan land use infrastructure: Providing enough camps to facilitate effective rotational grazing management is one way of making sustainable rangeland management easier.

After bush control activities, the treated landscape should not appear homogenous but have a mosaic character with a mix of trees and bushes (Appendix C). Clumps are important to provide shelter and large trees suppress woody saplings. Bush control on steep slopes is risky and not recommended because of potential erosion. Woody fines should be left on the land to improve soil organic matter, enhance soil moisture and seed germination, increase nutrient levels and reduce erodibility. Annual grasses normally capitalize after bush control activities but form an unstable vegetation cover with insufficient nutrients to sustain fodder to grazing animals throughout the year. To enhance the re-establishment of perennial grass it is often necessary to leave more bush initially.

5 COMMUNICATION AND TRAINING

To ensure potential risks and impacts are minimised personnel must be appropriately informed and trained to ensure risks are mitigated. It is also important that regular effective communications are maintained with stakeholders (including neighbouring farmers) and made aware of potential impacts and how to minimise or avoid them.

5.1 COMMUNICATIONS

Jumbo Charcoal shall communicate environmental issues to all personnel through the following means (as and when required):

- Ensure all personnel are allowed to attend an environmental site induction that sets out their requirements concerning this GEMP
- Ensuring audits and inspections are undertaken regularly on a risk-based schedule
- Toolbox talks, including instruction on incident response procedures
- Deliver project-specific environmental briefings where required
- Ensure all personnel have access to the GEMP
- Ensure operators of key activities and environmentally sensitive operations are briefed and understand their requirements.

5.2 ENVIRONMENTAL EMERGENCY AND RESPONSE

TABLE 8 - EMERGENCY CONTACT DETAILS

TOWN	AMBULANCE	POLICE	FIRE BRIGADE
Gobasis	062 56 2275	062 1 0111	062 56 6666
Okahandja	062 50 3030	062 1 0111	062 50 1051
Omaruru	064 57 0037	064 1 0111	064 57 0028
Otjiwarongo	067 30 3734	067 1 0111	067 30 4444
Windhoek	061 21 1111	061 1 0111	061 21 1111

For any other significant environmental incidents, all relevant local and regional authorities (including traditional authorities, line ministries, I&APs) should be contacted as required and the MEFT office informed of the incident (telephone +264 61 284 2111, Windhoek). All correspondence with MEFT should be undertaken by the farmer/farm manager or appointed supervisor.

For the clean-up of smaller chemical spills, the relevant MSDS should be consulted to determine the appropriate clean-up procedure. Basic chemical spill response training will be provided as part of the site environmental induction, spill response equipment.

5.3 CONSENT

Group Scheme Members are responsible to communicate his/her intentions to implement bush control and charcoal production activities on their FMUs with his/her neighbours and other I&APs before commencement. For this reason, the signing of letters of consent is recommended to warrant

transparency, consistency and good record keeping. The consent letters contain information about the nature, scale, and sequencing of activities.

5.4 Complaints Handling and Recording

Any complaints received verbally or in writing by any personnel on the project site shall be recorded by the receiver on a complaint register that will detail the name and contact details of the complainant, date and time of the complaint, nature of the complaint, action taken to resolve issues, and date of complaint handover. Jumbo Charcoal shall be responsible for nominating the correct personnel to coordinate and resolve the issue.

The workforce shall be informed about the complaints register, its location and the person responsible, to refer residents or the public who wish to lodge a complaint. The complaint shall be informed in writing of the results of the investigation and action to be taken to rectify or address the matter(s). Where no action is taken, the reasons why are to be recorded in the register.

The complaints register shall be kept on the farm and will be available for government or public review upon request.

5.5 Training and Awareness

All employees shall be competent to perform tasks that have the potential to cause an environmental impact. Competence is defined in terms of appropriate education, training, and experience.

All personnel shall be inducted with the specific environment and social awareness training. The environment and social awareness training shall ensure that personnel are familiar with the principles of this EMP, the environment and social aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures. Jumbo Charcoal shall ensure a register of completed training is maintained.

6 CONCLUSION

This report accompanies the application for the renewal of the current environmental clearance certificate for the Jumbo Charcoal Group Scheme. Each FMU operating under the Group Scheme is required to meet stringent international FSC standards as well as national regulatory requirements. This Environmental report provides a framework setting out these requirements and stipulates the internal and external auditing for the group.

Through the implementation of FSC Principals and Criteria and International General Indicators; best practice measures set out in the SEA and government documentation; and the mitigation measures set out in the Generic and site-specific EMPs, potential environmental impacts that may arise from bush thinning and charcoal production activities on FMUs operating under the Jumbo Group Scheme are unlikely to be significant. Through sustainable bush thinning and charcoal production activities, various benefits can be achieved, including an increase in biodiversity and rangeland productivity, and benefits to the local community and economy.

This report provides confidence to the competent authority that any FMU operating under the Jumbo Group Scheme shall be legally compliant and apply best practice measures.

7 REFERENCES

CCA. (2010). CCA Bush-to-Fuel Project: Environmental Impact Assessment. April 2010. Compiled by Colin Christian & Associates cc, Windhoek. April 2010.

Cunningham, P.L. (1998). Potential wood biomass suitable for charcoal production in Namibia. Agri-Info 4(5), 4-8.

De Klerk, J. N. (2004). Bush Encroachment in Namibia: Report on Phase 1 of the Bush Encroachment Research, Monitoring, and Management Project. Ministry of Environment and Tourism, Directorate of Environmental Affairs.

Donaldson, CH. 1969. Bush encroachment with special reference to the Blackthorn problem of the Molopo area. Pretoria: Government Printer.

Doughill AJ, Thomas DG & Heathwaite AL. 1999. Environmental change in the Kalahari: Integrated land degradation studies for non-equilibrium dryland environments. Annals of the Association of American Geographers, 89 (3):19–46.

De-bushing Advisory Services (2017). Bush control manual. Windhoek: Prepared by AgriConsult Namibia, Ministry of Agriculture, Water and Forestry / Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Energypedia (30th April, 2018) *Charcoal Production.* Retrieved from https://energypedia.info/wiki/Charcoal_Production, Accessed May 2018.

Forest Stewardship Council. (2019). *First FSC National Forest Stewardship Standard for the Republic of Namibia is Approved*. [online] Available at: https://fsc.org/en/newsfeed/first-fsc-national-forest-stewardship-standard-for-the-republic-of-namibia-is-approved [Accessed 18 Jun. 2021].

Forest Stewardship Council. (2020). The FSC National Forest Stewardship Standard for the Republic of Namibia.

Government of the Republic of Namibia (2005, 2015). Forest Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005 and its regulations of 2015.

Government of the Republic of Namibia (2007, 2012). Environmental Management Act, No. 7 of 2007 and its regulations of 2012.

International Finance Corporation (2013). International Finance Corporation CIA and Management Good Practice Handbook. Washington, DC: The World Bank

Joubert, D.F. (2014). The dynamics of bush thickening by Acacia mellifera in the Highland Savanna of Namibia. PhD Thesis, University of the Free State.

Joubert, D. F. & Zimmmerman, I. (2002). The potential impacts of wood harvesting of bush thickening species on biodiversity and ecological processes. Proceedings of the First National Forestry Research Workshop held on 12 and 13 March 2002 in Windhoek, Namibia, Ministry of Environment and Tourism, Forestry Publication 9,67-78.

Mendelsohn, J., Jarvis, A., Roberts. C. and Robertson, T. (2003) Atlas of Namibia, A Portrait of the Land and its People. Published for the MET by David Phillips, South Africa.

Ministry of Agriculture, Water and Forestry and Ministry of Environment and Tourism (MAWF& MET) (2017). Forestry and Environmental Authorisations Process for Bush Harvesting Projects.

Ministry of Agriculture, Water and Forestry (MAWF) (2012). National Rangeland Management Policy (Part I) and Strategy (Part II), Restoring Namibia's Rangelands.

South African Institute for Environmental Assessment (SAIEA), (2015). The Strategic Environmental Assessment of Large-Scale Bush Thinning and Value-Addition Activities in Namibia.

Smit, G.N. (2014). BECVOL 3: an expansion of the aboveground biomass quantification model for trees and shrubs to include the wood component. African Journal of Range and Forage Science, 31(2), 179-186.

UNIDO and MAWF (2019). Strategic Action Plan for Sustainable Bush Value Chains in Namibia. *UNIDO*, pp.1–46.

APPENDIX A - LIST OF PROTECTED SPECIES

Species name	Common names (English)	Reasons to be protected (ES = Ecosystem Services; EU = Extent of use)
Acacia erioloba E. Mey.	Camel-thorn	EU (Heavily utilized by humans andanimals - medicinal, cash crop, unsustainable harvesting of fuel wood for export, slow growth rate, cultural value, economic value, ES (keystone species)
Acacia nigrescens Oliv	Knob-thorn	EU (Used by humans and animals -wood used for construction, utensils, fuel, tanning, browsed by game), ES (retains river banks)
Acanthosicyos horridus Welw. Ex Hook.f.	Nara	Cultural and economic value, ES (Dune stabiliser)
Adansonia digitata L.	Baobab	ES2 (Keystone species) EU (heavily utilised by humans and animals)
Adenia pechuelii (Engl.)	Harms Elephants-foot	EU (unsustainable harvesting for horticultural trade), slow growth rate, Slow and/or episodic recruitment
Adenium boehmanium Schinz	Bushman poison	EU (unsustainable harvesting for horticultural trade)
Afzelia quanzensis Welw.	Pod mahogany	EU (Extensively used by humans and animals- curios, medicinal, timber, potential as ornamental trees, browsed by animals), slow growth rate, Restricted range.
Albizia anthelmintica (A.Rich.) Brongn.	Worm-cure albizia	EU (Utilized by humans and animals - medicinal, utensils, browsed by livestock and game)
Aloe dichotoma Masson	Quiver tree	EU (unsustainable harvesting for horticultural trade), Slow growth rate, Cultural value, Slow and/or episodic recruitment
Aloe pillansii L. Guthrie	Giant quiver tree	Slow growth rate, Restricted range, Slow and/or episodic recruitment
Aloe ramosissima Pillans	Maiden's quiver tree	Slow growth rate, Restricted range, Slow and/or episodic recruitment
Baikiaea plurijuga Harms	Zambezi teak or Rhodesian teak	EU (heavily utilised for timber, implements, utensils, wood carvings)
Berchemia discolour (Klotzsch) Hemsl.	Bird-plum	EU (heavily utilised by humans and animals)
Boscia albitrunca (Burch.) Gilg & Gilg-Ben.	Shepherd's tree	EU (heavily utilised by humans and animals)
Burkea africana Hook.	Burkea	EU (heavily utilised by humans - timber, firewood, implements)
Caesalpinia merxmeullerana A.Schreib.	Orange-river caesalpinia	Restricted range
Citropsis daweana Swingle & M.Kellerm.		EU (Wild crop relative - genetic resource), Restricted range
Colophospermum mopane (J. Kirk ex Benth.) J. Kirk ex J. Léonard	Mopane	EU (heavily utilised by humans and animals (browse and forage) - charcoal, timber, fuel wood, construction, medicine, host to important edible caterpillar), slow growth rate, cultural value.
Combretum imberbe Wawra	Leadwood	EU (heavily utilised by humans and animals - fuel wood, construction material, implements, illegally harvested for charcoal, other purposes, browse, shade) Cultural value, Extremely slow growth rate.

Species name	Common names (English)	Reasons to be protected (ES = Ecosystem Services; EU = Extent of use)
Commiphora capensis (Sond.) Engl.	Namaqua corkwood	EU (illegally harvested for horticultural trade), Restricted range
Commiphora cervifolia J.J.A.van der Walt	Antler-leaved corkwood	EU (illegally harvested for horticultural trade), Restricted range
Commiphora dinteri Engl.	Namib corkwood	EU (illegally harvested for horticultural trade)
Commiphora gariepensis Swanepoel	Orange River corkwood	Restricted range
Commiphora giessii J .J. A. van der Walt	Brown-stemmed corkwood	Restricted range
Commiphora gracilifrondosa Dinter ex J. J. A. van der Walt	Karee corkwood	Restricted range, EU (illegally harvested for horticultural trade), Restricted range
Commiphora kraeuseliana Heine	Feather-leafed corkwood	EU (illegally harvested for horticultural trade), Restricted range
Commiphora namaensis Schinz	Nama corkwood	EU (illegally harvested for horticultural trade)
Commiphora oblanceolata Schinz	Swakopmund corkwood	Very small, widely scattered populations, Restricted range
Commiphora saxicola Engl.	Rock corkwood	EU (illegally harvested for horticultural trade)
Commiphora virgata Engl.	Slender corkwood	Value (cultural - host to edible caterpillar)
Commiphora wildii Merxm.	Oak-leaved corkwood	EU (resin for perfume), Value (cultural - perfume)
Cyphostemma bainesii (Hook. F.) Desc.	Gouty vine	EU (illegally harvested for horticultural trade), Restricted range
Cyphostemma currorii (Hook. F.) Desc.	Kobas	EU (illegally harvested for horticultural trade)
Cyphostemma juttae (Dinter & Gilg) Desc.	Blue kobas	EU (illegally harvested for horticultural trade), Restricted range
Cyphostemma uter (Exell &Mendonça) Desc.	Kaoko kobas	Restricted range
Dialium engleranum Henriq.	Kalahari podberry	EU (Extensively used by humans – fruit an important part of diet of San and Kavango peoples, medicinal, timber, implements)
Diospyros mespiliformis Hochst. Ex A.DC.	Jackal-berry	EU (Heavily utilised by humans and animals - important fruit tree, timber, cash crop, utensils, watos, fuel wood, medicinal, fruit eaten by animals and frugivorous birds), slow growth rate.
Elephantorrhiza rangei Harms	Karas elephant-root	Restricted range and habitat
Entandrophragma spicatum (C.DC) Sprague	Owambo wooden-banana	Cultural value, slow growth rate, Restricted range
Erythrina decora Harms	Namib coral-tree	Small populations scattered over wide area, Cultural value, potential horticultural value

Species name	Common names (English)	Reasons to be protected (ES = Ecosystem Services; EU = Extent of use)
Euclea asperrima Friedr.-Holzh.	Mountain guarri	Restricted range
Euclea pseudebenus E. Mey. Ex A. Dc.	Wild ebony	ES (Keystone species, prevent erosion of water courses), Slow growth rate
Faidherbia albida (Delile) A.Chev.	Ana tree	ES (Important component of riparian fringe, prevents erosion of river beds, Keystone species), EU (heavily utilised by stock and game, important shade tree in arid west).
Ficus burkei (Miq.) Miq.	Strangler fig	EU (fruit for humans and animals), Restricted range
Ficus cordata Thunb.	Namaqua rock-fig	EU (fruit for humans and animals)
Ficus sycomorus L.	Sycamore fig	EU (fruit for humans and animals)
Guibourtia coleosperma (Benth.) J. Léonard	False mopane	EU (Heavily utilised by humans and animals - food, cash crops, very important shade tree, timber, watos, utensils)
Hyphaene petersiana Klotzsch ex Mart.	Makalani palm	EU (heavily utilised by humans and animals - utensils, basketry, thatching, fuel, ropes, palm wine, food)
Kirkia dewinteri Merxm. & Heine	Kaoko kirkia	Restricted range
Lannea discolor (Sond.) Engl.	Live-long	EU (used by humans and animals), Restricted range
Maerua schinzii Pax	Ringwood tree	EU (heavily used by humans and animals), slow growth rate
Moringa ovalifolia Dinter & A.Berger	Phantom tree	EU (heavily used by humans and animals - horticultural value, browse, tourism)
Neoluederitzia sericeocarpa Schinz	Silk-seed bush	Restricted range
Ozoroa concolor (C. Presl. Ex Sond.) De Winter	Green resin-bush	Restricted range, scattered distribution
Ozoroa namaquensis (Sprague) Von Teichman & A. E. van Wyk	Gariep resin-tree	Restricted range
Pachypodium lealii Welw.	Bottle tree	Slow growth rate, EU (unsustainable harvesting for horticulture trade)
Pachypodium namaquanum (Wyley ex Harv.) Welw.	Elephant-trunk	Slow growth rate, EU (unsustainable harvesting for horticulture trade), Restricted range
Pappea capensis Eckl. & Zeyh.	Jacket-plum	ES (Keystone species, prevents erosion in rivers), EU (utilised by humans and animals - important shade tree, edible fruit, browsed)
Philenoptera violacea (Klotzsch) Schrire.	Apple-leaf, rain tree	ES (important component of riparian and floodplain canopy) EU (utilised by humans and animals - fences, watos, medicines, browse, fodder)
Protea gaguedi J. F. Gmel.	African white protea	Restricted range, EU (heavily utilised by humans – medicinal overharvesting of roots)
Pterocarpus angolensis DC.	African teak, kiaat	Value (economic), EU (heavily utilised for timber, implements, utensils, wood carvings)
Salix mucronata subsp. Capensis (Thunb.) Immelman	Small-leaved willow, river willow	ES (stabilisation of river banks, shade), EU (Heavily utilised by humans – overharvesting for fuel wood, potentially threatened), Restricted range

Species name	Common names (English)	Reasons to be protected (ES = Ecosystem Services; EU = Extent of use)
Schinziophyton rautanenii (Schinz) Radcl.-Sm.	Manketti	EU (heavily utilised by humans and animals - utensils, curios, musical instruments, timber, shade, fruit a very important food and cash crop)
Schotia afra (L.) Thunb. var. *angustifolia* (E. Mey.) Harv.	Karoo schotia	EU (Utilised by humans for wood), Restricted range
Sclerocarya birrea (A. Rich.) Hochst.	Marula	EU (Heavily utilised by humans and animals for fruit, shade, browse, medicines, wood).
Searsia lancea (L. F.) F. A. Barkley	Karee	ES (Prevent erosion of river banks)
Sesamothamnus benguellensis Welw.	Kaoko sesame-bush	EU (Illegally harvested for the horticultural trade), slow growth rate, Restricted range
Sesamothamnus guerichii (Engl.) E. A. Bruce	Herero sesame-bush	EU (Illegally harvested for the horticultural trade), slow growth rate
Sesamothamnus leistneri Giess ex Ihlenf., ined.	Large-leaved sesame-bush	EU (Illegally harvested for the horticultural trade), slow growth rate, Restricted range
Spirostachys africana Sond.	Tamboti	EU (Heavily utilised by humans - timber)
Sterculia africana (Lour.) Fiori	African star-chestnut	Economic value (tourism and horticulture) EU (utilised by humans – medicinal and food)
Sterculia quinqueloba (Garcke) K. Schum.	Large-leaved sterculia	Economic value (tourism and horticulture), restricted habitat
Strychnos cocculoides Baker	Corky monkey-orange	Economic value (cash crop), EU (heavily utilised by humans and animals - fruit)
Strychnos potatorum L. F.	Black bitterberry	ES (Important component of river and flood plain vegetation) EU (utilised by humans (fish poison, shade) and animals (food and shade), Restricted range.
Strychnos pungens Soler.	Spine-leaved monkey-orange	Economic value (cash crop), EU (heavily utilised by humans and animals - fruit, medicinal)
Strychnos spinosa Lam.	Spiny monkey-orange	Economic value (cash crop), EU (heavily utilised by humans and animals - fruit and furniture), Restricted range
Tamarix usneoides E. Mey. Ex Bunge	Wild tamarisk	ES (prevents erosion of river beds and river banks, an important component of riparian vegetation), EU (browsed by the game)
Tylecodon paniculatus (L. F.) Toelken	Southern botterboom	EU (unsustainable harvesting – horticultural trade), Restricted range
Welwitschia mirabilis Hook f.	Welwitschia	Cultural value, scientific value, economic value (tourism)
Ziziphus mucronata Willd.	Buffalo-thorn	ES (prevents erosion of river beds and river banks, important component of riparian vegetation) EU (Utilized by humans and animals - medicinal, construction, implements, fuel wood, browsed by livestock and game.

APPENDIX B – JUMBO TOOLKITS

APPENDIX C - RECOMMENDED DENSITY OF TREES AFTER BUSH THINNING

This appendix defines what level of bush thinning is most appropriate, categorized according to the main encroacher species. The information is based on De Klerk (2004), the draft policy on bush encroachment (2004), and the opinion of six bush experts (Dave Joubert, Nico de Klerk, Axel Rothauge, Ben Strohbach, Cornelis van der Waal, Roelie Venter).

The recommendations use a formula based on tree equivalents (TEs) and average annual rainfall. A TE is defined as a woody tree/bush of 1.5 metres in height. Thus a 3 m tree represents 2TE. A 0.75 m tree/bush represents half a TE.

Main principles:

- All bush thinning should aim to leave a heterogeneous mix of trees and bush. The veld that remains should have a variety of tree species (including some of the encroacher species), of different size classes, and space so that there are some open patches and some dense patches, to provide a variety of habitats for animals.
- Bush thinning should be carried out in a phased approach so that the system is not shocked by an abrupt change from dense bush to open veld.
- If arboricides are going to be used, only foliar (leaf spray) and stem-applied arboricides are recommended. Pellets should not be used, as they tend to get washed along the surface by rain and end up in non-target areas.
- Dry riverbeds tend to carry more trees and larger trees. Forestry regulations state that trees should not be killed within 100 m of a river course. Thinning is required in densely encroached river margins, but one should leave a higher density of trees than on the adjacent habitat. It is especially important to leave the large trees and protected species along a river course. The exception to this is *Prosopis spp.*, which invades riverbeds, but should be eradicated.
- Judicious thinning should leave behind enough trees (applying the formulas provided) to create a more stable savanna that does not need major intervention at short intervals after the initial thinning.
- Training of the workforce is necessary before harvesting starts so that workers know which trees to target and which to avoid. Work teams need to be managed so that any excessive harvesting or killing of the wrong species is noticed and corrected.

DOMINANT SPECIES	TREE EQUIVALENT (TE)
Acacia spp.	– Leave large trees with a stem greater than 18 cm in diameter – Leave protected species – Leave enough *Acacias* so that the total density of TEs per hectare = 1.5 times the average rainfall. i.e. in an area with ~400 mm rain, the total density of all trees should be ~600 TEs / ha. – In sandy substrates, leave enough *Acacias* so that the total density of TEs per hectare = 2 times the average rainfall. i.e. in an area with ~400 mm rain and sandy soil, the total density of all trees should be ~800 TEs / ha.
Dichrostachys cinerea	– Leave large trees with a stem greater than 18 cm diameter, as well as individuals with a stem greater than 10 cm diameter (these are taller).

DOMINANT SPECIES	TREE EQUIVALENT (TE)
	– Leave enough *Dichrostachys* so that the total density of TEs per hectare = 1.5 times the average rainfall i.e., in an area with ~400 mm rain, the total density of all trees should be ~600 TEs / ha. – Protect the soil surface by packing brush – Aftercare is essential to prevent re-infestation
***Terminalia sericea**	– Leave large trees with a stem greater than 18 cm in diameter – Leave enough *Terminalias* so that the total density of TEs per hectare = 3 times the average rainfall i.e., in an area with ~400 mm rain, the total density of all trees should be ~1,200 TEs / ha. This recognizes the extra importance of the trees is supplying nutrients to the sandy soil. **(A large *Terminalia sericea*, approx. 6 m high, is 4 TEs!)**
Mopane	– Leave large trees with a stem greater than 18 cm in diameter – Leave protected species – Leave enough mopanes so that the total density of TEs per hectare = 2 times the average rainfall. i.e. in an area with ~400 mm rain, the total density of all trees (all species) should be ~800 TEs / ha. This recognizes the importance of mopanes as fodder. – All cases where thinning is planned in the mopane-dominated veld, especially where the veld is degraded (e.g. lack of grass, soil erosion) should first be inspected by DoF officials or a bush expert, to assess the level of harvesting that should be done. It might be advisable in such conditions to leave more trees than the 2x rainfall amount specified above.
***Rhigozum trichotomum**	– Leave enough *Rhigozum* so that the total density of TEs per hectare = 2 times the average rainfall i.e., in an area with ~200 mm rain, the total density of all trees and bushes should be ~400 TEs / ha. **(A *Rhigozum* bush is usually ~0.75 m tall, i.e. 0.5 TEs. If there are no other trees or bushes, the density of *Rhigozum* should be ~800 bushes/ha**
***Prosopis spp.**	– Take out all Prosopis trees. – Use only approved methods, such as manual chopping or responsible use of arboricides. Do not use polluting methods such as applying engine oil to cut stems.

*Species that are not expected to occur on the farm.

COMPLIANCE REGISTER

All operations and activities on the farm unit shall comply with international and national legal requirements. The principles of the most relevant laws and policies applicable to the bush control and charcoal activities include:

- **Conservation of soil and water resources, maintenance of biological diversity and use of wood products in a sustainable manner;**
- **Protection of the environment, without compromising optimum sustainable yields;**
- **Reducing the rates of environmental degradation caused by unsustainable deforestation, soil erosion, overgrazing and bush encroachment;**
- **Promoting the development and use of alternative sources of energy;**
- **Creating favorable conditions to attract investment in small and medium industry based on wood;**
- **Controlling encroacher bush (alien and indigenous) and the improvement of rangeland quality in a sustainable manner;**
- **Paying subsidies and grants to meet the objectives of the Soil Conservation Act.**

A summary of the legal and regulatory requirements are outlined below:

	Strongly recommended, highly relevant
	Consider, may contain implied relevance
R	Recommended to have
NR	Not Recommend

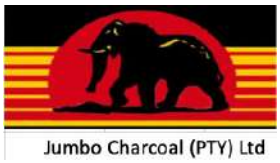
YEAR	NAME	Electronic copy	DESCRIPTION
CURRENT NAMIBIAN LEGISLATION			
1990	The Constitution of the Republic of Namibia of 1990	R	The fundamental principles of environmental protection and sustainable development as well as the wellbeing of Namibians are underpinned by the constitution
1990	Stock Theft Act No. 12 of 1990, as amended Act No. 19 of 2004	R	Relevant to the control and penalties implied by stock theft on a farm
1990	Petroleum Products and Energy Act, No. 13 of 1990, and regulations relating to the purchase, sale, supply, acquisition, usage, possession, disposal, storage, transportation, recovery and refinement of used mineral oil as published in GN 112 of 1991 (GG 281 of 21 October 1991) ("1991 regulations") and the petroleum product regulations published in GN 155 of 2000 (GG 2357 of 23 June 2000) ("2000 regulations"), the Petroleum Products and Energy Amendment Act, No. 29 of 1994 and the Petroleum Products and Energy Amendment Act, 2000	R	Regulation 3 requires that all used mineral oil is stored in appropriate containers in adequately bunded areas. A bulk consumer should ensure that it is not in possession of more than 2,000L of used mineral oil for a continuous period of more than 30 days. In compliance with the provisions of Regulation 4, all used oil needs to be processed at a sludge farm where the sludge is neutralised (in many cases with ammonium nitrate) and the remains are disposed of at an appropriate bioremediation site. The operation has to be in possession of the necessary certificates, ensure that storage tanks do not pose a risk of environmental harm and that any major petroleum product spill is reported and cleaned up according to good petroleum industry practices.
1990	Foreign Investment Act, No. 27 of 1990 (as amended by Foreign Investment Amendment Act, No. 24 of 1993)	NR	In as much as there are foreign investment made, an operation should be mindful of the fact that the granting of preferential investment status is influenced, inter alia, by the impact which the activities is likely to have on the environment.
1990	Legal Aid Act, No. 29 of 1990	NR	To provide for the granting of legal aid in civil and criminal matters to persons whose means are inadequate to enable them to engage practitioners to assist and represent them; and to provide for matters incidental thereto.
1991	Racial Discrimination Act, No. 26 of 1991	NR	To render criminally punishable, in pursuance of the provisions of Article 23 of the Namibian Constitution, certain acts and practices of racial discrimination and apartheid in relation to public amenities, the provision of goods and services, immovable property, educational and medical institutions, employment, associations, religious services, and involving the incitement of racial disharmony and victimisation; to amend the Liquor Ordinance, 1969 and the Admission of Persons to Namibia Regulation Act, 1972; and to provide for matters incidental thereto.
1994	Import and Export Control Act, No. 30 of 1994	NR	Some chemical substances that are imported are hazardous and have the potential for land-based pollution in the case of accidental spillage. Plans and procedures need to be in place to minimize the risk of accidental spillage as well as emergency plans in place to deal with incidents of accidental spillage and contractually requires contractors engaged for the handling and transport of these substances to do likewise in order to avoid pollution. All dangerous goods imported are handled in accordance with the rules laid down in the IMDG Code in compliance with the provisions of Regulation 105.
1994	Social Security Act, No. 34 1994	R	All provisions stipulated during the employing of a person.All workers must be regsistered for social security.
1997	Namibian Water Corporation Act, No. 12 of 1997	NR	Bulk water supply to bulk consumers of water in Namibia is primarily supplied by Namwater.
1997	Council of Traditional Leaders Act, No. 13 of 1997	NR	To provide for the establishment of the Council of Traditional Leaders and to define its powers, duties and functions; and for matters incidental thereto.
1998	Customs and Excise Act, No. 20 of 1998	NR	To provide for the levying, imposition, payment and collection of customs and excise duties; to prohibit and control the import, export or manufacture of certain goods; and to provide for matters incidental thereto.
1998	The Health Act, No. 21 of 1988	NR	Health facilities (such as a clinic) fall within the definition of a private health facility, which means that owner is obliged to ensure that the clinic has the requisite licence to operate as a private health facility.
1998	Affirmative Action Employment Act, No. 29 of 1998	NR	To consolidate legislation related to equal opportunity in employment in accordance with Article 10 and Article 23 of the Namibian Constitution; to provide for the establishment of the Employment Equity Commission; to redress through appropriate affirmative action plans the conditions of disadvantage in employment experienced by persons in designated groups arising from past discriminatory laws and practices; to institute procedures to contribute towards the elimination of discrimination in employment; and to provide for matters incidental thereto.
1999	Road Traffic and Transport Act, No. 22 of 1999	R	The act regulates traffic on public roads, vehicle licensing, registration, cross boarder road transportation as well as the transportation of dangerous goods for which the necessary permits are required.
2000	Value Added Tax Act, No. 10 of 2000	NR	The Namibian government generates revenues through a variety of mechanisms, helping to ensure a steady stream of revenues.
2000	Traditional Authorities Act, No. 25 of 2000	NR	To provide for the establishment of traditional authorities and the designation, election, appointment and recognition of traditional leaders; to define the powers, duties and functions of traditional authorities and traditional leaders; and to provide for matters incidental thereto.
2001	The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005 and its regulations	R	The purpose of the act is consolidate the laws relating to the management and use of forest and bush-based resources , to provide for the protection of the environment and the control and management of forest fires and to deal with incidental matters related to forest and bush-based resources. Implied by the act, a harvesting permit, a transport permit and a marketing permit are necessary. The farm unit shall apply for a harvesting permit every three months for the duration of harvesting activities. Specification of the permit include: • Aerial spraying of arboricides is a prohibited activity. • No protected species may be harvested without written consent from DoF • No trees with a basal stem diameter greater than 18cm may be harvested without written consent from DoF • Only species listed on the permit may be harvested A transport permit is valid for seven days and a marketing permit for three days.
2002	Communal Land Reforms Act, No. 5 of 2002	NR	Act provides for secure tenure over commonage land rights to safeguard the use of resources on communal land. The act deals with the access to land in communal areas by regulating land right allocation to residents in those areas and the establishment of communal land boards tasked with the administration of communal land.
2003	Inland Fisheries Resources Act No. 1 of 2003	NR	To consolidate legislation to provide for the conservation and protection of aquatic ecosystems and the sustainable development of inland fisheries resources; to provide for the control and regulation of inland fishing; and to provide for related matters.
2004	Criminal Procedure Act, No. 25 of 2004	NR	To make provision for procedures and related matters in criminal proceedings.
2004	National Heritage Act, No. 27 of 2004	R	In the event that any archaeological or palaeontological objects as described in this act are found in the course of its operations such find needs to be reported to the authorities immediately. A permit would be required for the disturbance, relocation, removal or destruction of any heritage resources discovered on the unit site. If necessary the relevant permits must be obtained before disturbing or destroying any object of heritage significance as envisaged by this act.
2004	Companies Act, No. 28 of 2004	NR	To provide for the incorporation, management and liquidation of companies; and to provide for incidental matters.
2006	Children's Status Act, No. 6 of 2006	NR	To provide for children born outside marriage to be treated equally regardless of whether they are born inside marriage or outside marriage; to provide for matters relating to custody, access, guardianship and inheritance in relation to children born outside marriage; to provide for matters which are in the best interest of all children; and to provide for matters connected thereto.
2007	Motor Vehicle Accident Fund Act, No. 10 of 2007	NR	The act provides for the establishment, administration and management of the Motor Vehicle Accident Fund as an administrative body to provide assistance and benefits to persons injured in motor vehicle accidents and to dependents of persons killed in such accidents; and to provide for incidental matters.
2007	The Labour Act, No. 11 of 2007 (Regulations relating to the Health & Safety of Employees at Work promulgated in terms of Section 101 of the Labour Act, No. 6 of 1992 - GN156, GG 1617 of 1 August 1997)	R	Stringent health and safety policies, including the compulsory use of specific PPE in designated areas to ensure adequate protection against health and safety risks, have to be in place. Proper storage and labeling of hazardous substances are required. Implementing of a comprehensive waste management and disposal policy is necessary - this should include the management and disposal of hazardous substances (excluding nuclear or radioactive waste), and accompanying certificates of disposal. Hazardous substances that do constitute nuclear or radioactive waste need to be disposed of at a designated area in terms of a license issued by the NPRA under the Atomic Radiation Protection Act. Employees in charge of and working with hazardous substances need to be aware of the specific hazardous substances in order not to compromise worker and environmental safety in the event of accidental breakage or spillage. Transport of various hazardous substances requires staff responsible for such transport to be properly trained in the handling of the substance and that adequate safety and emergency response plans are place in case of accidental spillage. Each worker must have a work agreement, is regsitered for social security and receives more than the minimum wage per month. Noteworthy is that a collective agreement on minimum wages for workers in the agricultural sector (2003) exists. Guidelines and instructions pertaining to HIV/AIDS in employment are issued in GN 78/1998 (GG 1835) A Code of Good Practice on Industrial Action (Strikes and Lock-outs) exists GN 208/2009 (GG 4361).
2007	Electricity Act, No. 4 of 2007	NR	Related to the generation of electricity for own consumption
2007	Environmental Management Act, No. 7 of 2007 (and its Regulations promulgated in 2012)	R	All activities listed in the regulations of the act require impact assessments and accompanying environmental management plans, for which environmental clearance certification by the authorities need to be issued. Environmental clearance certificate shall be obtained for the group scheme. As part of the conditions, the farm unit shall undertake an EIA and generate an EMP. The environmental clearance certificate is valid for up to three years
2010	Tobacco Products Control Act, No. 1 of 2010	NR	The objective of this act is to establish a Tobacco Products Control Committee to advise the minister on matters relating to the use of tobacco products; to provide for the constitution, powers, duties and functions of the committee; to provide for the reduction of demand for and supply of tobacco products; to provide for protection from exposure to tobacco smoke; to provide for the establishment of the Tobacco Products Control Fund; to provide for matters relating to the enforcement of the act; and to provide for matters incidental thereto.
2012	Flexible Land Tenure Act, No. 4 of 2012	NR	Act creates new forms of titles to immovable property, to provide for the nature of rights conferred by these new forms of title and to provide for matters incidental thereto
2013	Water Resources Management Act, No. 11 of 2013	R	This act has been billed but not promulgated and cannot be enacted as the regulations have not been passed, so the Water Act 54 of 1956 is still in effect.
2017	Nature Conservation Amendment Act, No. 3 of 2017	R	Like all other amendments to the Nature Conservation Ordinance, No. 14 of 1975, the amendment of 2017 is applied in addition to the original ordinance. This particular amendment stipulates fines for different transgressions and admission of guilt fines.

FORMER SOUTH AFRICAN AND SWA LEGISLATION STILL APPLICABLE IN NAMIBIA			
1939	Shop Hours and Shop Assistants Ordinance, No 15 of 1939	NR	Apply to the operation of a farm shop
1941	Employees Compensation Act, No. 30, 1941	R	To amend and consolidate the laws relating to compensation for disablement caused by accidents to or industrial diseases contracted by employees in the course of their employment, or for death resulting from such accidents and diseases.
1947	The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, No. 36 of 1947 and amendments	NR	Relevant to the handling, transport, storage, use and disposal of chemicals on a farm
1955	Artesian Water Control Ordinance, 1955	NR	Initially enacted as an ordinance. It was then deemed by section 180(5) of the Water Act 54 of 1956, as amended by the Water Amendment Act 77 of 1969, to constitute regulations.
1956	Water Act, No. 54 of 1956 (Regulations in respect of Subterranean water control Areas SWA)	R	Abstraction of water from boreholes requires an abstraction permit. Abstraction rates need to be measured and reported to the authorities in accordance with the requirements of this legislation. In addition, annual reporting on the environmental impacts of water abstraction is recommendable. Users of water for industrial purposes are obliged to purify or otherwise treat the water used and any effluent produced by such use in accordance with requirements set out in section 21(1) and (2) of the act. The applicable standards for Namibia are those which were promulgated by the authorities by notice in the gazette in 1962 (R553 Regional Standards for Industrial Effluent, in Government Gazette No 217 dated 5 April 1962). Should waste water be discharged, a permit is required. A comprehensive plan to avoid the pollution of groundwater is required. Implied by the legislation, water permits, borehole drilling permits, abstraction permits and discharge permits (if applicable) are required.
1969	Soil Conservation Act, No. 76 of 1969	R	Conservation of soil, in particular the preventing of soil erosion, siltation and pollution of soil is underpinned by this legislation. The purpose of the act is to consolidate laws relating to the combating of soil erosion, the conservation, improvement and manner of use of soil and vegetation, the prevention and control of veld fires, erosion, siltation, pollution and soil disturbance, protection of water courses and to provide for matters incidental thereto. The farm unit shall prevent the disturbance of soil which creates or may create soil erosion, or pollution.
1974	Hazardous Substances Ordinance, No. 14 of 1974	R	Handling, transport, storage, use and disposal of hazardous substances are regulated by this legislation. The purpose of the act is to provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products; to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products; and to provide for matters connected therewith.
1975	Nature Conservation Ordinance, No. 14 of 1975	R	To consolidate acts relating to the conservation of nature, including the establsihment of game parks and nature reserves, the control of problem animals and to provide for matters incidental thereto. The act makes provision for the protection of various fauna and flora species, utlization of huntable species and specially protected species. This legislation needs to be applied in consulation with all amendments, including the Nature Conservation Amendment Act, No. 3 of 2017.
1976	Atmospheric Pollution Prevention Ordinance, No. 11 of 1976	R	Section 28 of the Ordinance is of particular relevance. Accordingly a comprehensive dust suppression and monitoring programme is required (e.g. special compound on dirt roads and other surfaces to minimise dust from vehicles and heavy mining equipment). An Air Quality Management Programme is required - to measure dust fall-out and to monitor ambient PM10 emissions. Section 35 of the Ordinance requires an operation to ensure that vehicles do not emit noxious or offensive gases and to minimize the risk of excessive vehicle gas emissions.
1981	Income Tax Act, No. 24 of 1981	NR	The Namibian government generates revenues through a variety of mechanisms, helping to ensure a steady stream of revenues.
NAMIBIAN POLICY			
1993	Water Supply and Sanitation Policy	R	Related to waste water management
1994	Policy for the Conservation of Biotic Diversity and Habitat Protection	R	Related to environmental protection
1995	Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation	NR	Related to environmental protection. Replaced by the regulations of the Environmental Management Act, No. 7 of 2007.
1998	Draft White Paper on the Energy Policy of Namibia	NR	Related to green energy
2000	National Water Policy White Paper	NR	Related to waste water management

DRAFT LEGISLATION			
2000	Draft Road Traffic and Transport Regulations	NR	Related to the transport of dangerous goods
2004	Draft Pollution Control and Waste Management Bill	R	Related to environmental protection
NATIONAL GUIDANCE			
2017	Namibia's 5th National Development Plan, 2017/2018–2021/2022	R	Long term guiding document on the development of the country's economy.
2030	Namibia vision 2030	R	A comprehensive framework to fundamentally transform the Namibian political and economic landscape in areas such as land reform, housing, the environment, health, education and building an economy that provides equal opportunities for all.
INTERNATIONAL CONVENTION LAW (Laws which Namibia is a signitory to)			
1973	Convention on International Trade and Endangered Species of Wild Fauna and Flora	R	Implied by existing pieces of legislation related to environmental protection
1985	Vienna Convention for the Protection of the Ozone Layer	NR	Implied by legislation related to environmental protection
1987	Montreal Protocol on substances that deplete the Ozone Layer	NR	Implied by many other pieces of legislation related to environmental protection. Latest adjustments regarding CFC phase out plan and Terminal ODS phase out management plan for Namibia
1989	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	NR	Implied by legislation related to environmental protection
1989	The Rotterdam convention on the Prior Informed Consent Procedure for Certain Hazardous chemicals and Pesticides in International Trade	NR	Implied by legislation related to environmental protection
1992	The Rio de Janiero Convention on Biological Diversity	R	Implied by legislation related to environmental protection
1992	United Nations Framework Convention on Climate Change	NR	Implied by legislation related to environmental protection
1994	Convention to combat desertification	R	Implied by legislation related to environmental protection
1998	Kyoto Protocal on the Framework convention on Climate change	NR	Implied by legislation related to environmental protection
2001	Stockholm convention on Persistent Organic Pollutants	R	Implied by legislation related to environmental protection
INTERNATIONAL STANDARDS			
1996	ISO 140001	R	A principal management system standard which specifies the requirements for the formulation and maintenance of an EMS. This helps to control environmental aspects, reduce impacts and ensure legal compliance.
2012	World Bank Standards - Internantional Finance Corporation (IFC) & Equator principles (2013)	R	Implied by legislation related to environmental protection
2020	FSC National Forest Stewardship for the Republic of Namibia	R	This standard sets out the required elements against which FSC accredited Certification Bodies shall evaluate forest management practices within the scope of the standard. This standard is applicable to all forest operations seeking FSC certification within the standard and applies to Natural forest types and Non-Timber Forest Products (NTFPs) in Namibia.

Competent Authority: Refers to a person or organization that has the legally delegated or invested authority, capacity, or power to perform a designated function, such authority as may be notified. The principal regulatory authorities include:

- **Directorate of Forestry**
- **Department of Environment Affairs Department of Agriculture**
- **Department of Water Affairs**
- **Ministry of Fisheries and Marine Resources**
- **Ministry of Labour**
- **Department of Trade & Industry**



Jumbo Charcoal FMP

Jumbo Charcoal FMP

Incomplete

Score	0.52%	Failed items	0	Actions	0
Farm Name and Number					
Producer Name and Surname					
Conducted on					8th Jul, 2021
Auditor					ECC Admin

1. Farm ID 6.25%

1.1 Type of Audit / Inspection 0%

a. Type of Audit / Inspection

1.2 Pre Audit Check 0%

a. Any CARs, Observations open or other aspects to be considered on this farm?

1.3 Farm Details 0%

a. Common game species found on the farm?

b. Directions to the farm from Windhoek

c. Farm Size (use title deed size)

d. Boundary fence

e. Internal fences

f. District (Which office do you use to obtain Forestry permits?)

g. Anything under irrigation?

h. Dry land production?

i. Farming with?

j. Hunting activities on the farm?

k. Non-farming related activities (including tourism)

1.4 Member Details 0%

a. Role / Capacity of member

b. Member Date of Birth

c. Member mobile number

d. Member E-mail Address

1.5 Tenure / Proof of Ownership

a. Title deed or land tax certificate for each farm under the member

b. Written permission from traditional authority, if any

c. Written permission from chairman of conservancy, if any

d. Part of organization or union

1.6 Biophysical information of the farm unit

a. Annual rainfall in mm (use referenced source)

b. General topography (flat / plains, hills, mountains, valleys, other)

c. General soil type

d. Vegetation type & landscape (based on Namibian Atlas p99)

1.7 Vegetation

10%

a. Dominant grass species

b. Dominant woody species (generally also the encroacher spp/target spp)

c. How severe is the bush encroachment?

1

From 1 to 10

d. What are the consequences of bush encroachment?

1.8 Objective of bush thinning operation

a. Describe primary objective

1.9 Contact details of emergency services available

a. Police

b. Medical doctor

c. Ambulance

d. In the case of fire

e. Anti poaching

2. Production information 0%

2.1 Forest Production 0%

a. Price per ton producer recieves

b. SLIMF

c. Volumes of other biomass products sold this year?

d. Do you resell bought charcoal?

e. Volumes of FSC charcoal produced last year

f. Volumes of FSC charcoal produced this year

g. Open market system

h. Non-FSC charcoal/wood produced on the farm

i. Does the Producer sell any Non-Timber Forest Products (NTFP) (honey, meat, devil's claw)

2.2 Permits 0%

a. Valid harvesting permit(s)

b. Marketing permit(s)

c. Memorandum of agreement with Jumbo in place?

d. Supply agreement signed

2.3 Delivery notes 0%

a. Delivery Notes kept on record

2.4 Invoices 0%

a. Invoices kept on record

b. Invoice includes FSC certificate number

c. Invoice includes FSC 100%

d. Invoice numbers

2.5 Transport permits 0%

a. Transport permits kept on record

b. Delivery notes and invoices connected

3. Farm Map	0%
a. Farm size as per title deed	
b. Neighbours' farms are indicated	
c. All legal boundaries shown on map	
d. Camps shown on map	
e. Camp names / numbers shown	
f. Camp sizes indicated	
g. Waterpoints, homestead, cattleposts indicated	
h. Infrastructure (roads, servitudes, airfield, pipelines, power lines)	
i. Fire breaks	
j. Converted areas (grass lands)	
k. Water courses, pans and rivers	
l. Mountains and steep slopes	
m. RTEs	
n. Protected areas (wildlife, nesting, excluded area)	
o. Historical, cultural areas, grave sites, rock paintings	
p. Location of workers' accommodation indicated on map	
q. Location of current harvesting activities indicated on map	
r. Additional sites of concern (e.g. erosion, alien plants) indicated on map	
s. Certified areas, areas of aftercare, previously harvested or cleared indicated on map	
t. Field assessment sites (pre and post harvest sites) indicated on map	
u. Pre FSC areas marked	

4. Workers 0%

4.1 Worker Details 0%

a. Has there been any Covid-19 incidents on your farm?

b. Number of workers employed

c. Male / female ratio

d. Workers were recruited from local communities

e. All workers registered with Social Security

f. Farm rules are clear and communicated to workers

g. Job description of workers in place

h. Each worker has a signed contract

i. Harvesters subcontract family & friends

j. Members of unions / organisations

4.2 Remuneration/Rewards 0%

a. Minimum wages adhered to

b. Each worker produces >2 tonnes of charcoal monthly

c. Wage records available

d. Are there incentives in place to encourage higher productivity of quality in work?

e. Food supplies (rations) provided (free/sold meat eg.)

f. Records of additional upliftment opportunities (Supply of solar batteries, for example)

g. Workers incur more than 33% debt of their salaries?

4.3 Children 0%

a. Children on site

b. Children have access to education

4.4 Living conditions 0%

a. Access to medical facilities

b. Land owner to transport sick / injured people and their dependants

c. Toiletries supplied to workers

d. Housing is >1km away from burning operations

e. Housing is >200m away from sieving operations

f. Minimum accommodation provided is acceptable? (no plastic)?

g. Workers satisfaction with accommodation?

h. < 8 workers per house

i. Appropriate (M / F) washing facilities

j. Adequate privacy, one facility for 10 to 15 people

k. Separated (M / F) toilet facilities available

l. One clean, well ventilated long drop per <15 people

m. Workers satisfaction with toilet facilities

n. Spade is available to dig hole if needed in the field?

o. Training on hygienic maintenance

p. Daily hole of 60cm deep, covered with soil and top with stone or heavy piece of wood

q. Safe, clean drinking water accessible (<50 m away)

r. Water samples taken every 3 to 5 years

s. Complaints about drinking water

t. Empty hazardous containers in use

u. Waste management facility near housing

v. Housekeeping acceptable?

4.5 First Aid 0%

a. First Aid kit available on site

b. First Aid training provided

c. Certified and valid First Aid representative on site

4.6 PPE 0%

a. PPE register in place

b. Invoices of PPE purchased
c. PPE issued at least once per year
d. Manual workers use correct PPE (Overall, gumboots, hat)
e. Charcoal burners use correct PPE (Overall, gumboots, hat, gloves, dust mask)
f. Workers with mechanised equipment use correct PPE (Overall, gumboots, hat, noise protection)
g. Workers for stacking / loading use correct PPE (Overall, gumboots, hat, gloves, dust mask)

5. Harvesting 0%

5.1 Certified Area

a. Farm size minus excluded areas (in ha)

5.2 Wildlife Protection Area 0%

a. Total Size (in ha)

b. Is it at least 10% of the total farm size (title deed farm size)

c. Harvesting in WPA

5.3 Charcoal Production Area

a. Certified area minus WPA (in ha)

5.4 Total Excluded Area 0%

a. Size in ha

b. Why is this area excluded?

c. Is it indicated on the map (transparent red)

5.5 TE Assessment 0%

a. Has pre harvest count (50 x 2m, GPS coordinates) been done?

5.6 Planned Harvesting 0%

a. Current harvesting areas shown on map

b. Planned (future) harvesting areas identified (for a 5 year period)

c. Areas of protection considered in plan

d. Poaching deterrent zones indicated (usually 100 200m wide along farm boundaries and roads)

e. Fire breaks in place?

f. Other objectives (e.g. 200m thinning either side of farm roads)

5.7 Harvesting Methods

a. Method used

5.8 Optimising benefits 0%

a. Only species on permit are targeted

b. Trees larger than 18cm are targeted

c. Same height trees are completely harvested

d. One stem on multi-stemmed trees are left

e. Harvesting less than 100m away from river

f. Harvesting less than 1m away from termite mounds

g. Twigs left for ground cover and decomposition

h. Residual left for erosion control, promotion of germination and grass growth

i. Fire cutline created around kilns based on fire risk

5.9 Monitoring 0%

a. Checks on harvesters

6. Biodiversity 0%

6.1 Biodiversity 0%

a. Is connectivity maintained and enhanced through the harvesting plan?

b. Are there invasive alien plants occurring on the farm unit?

c. Are there any poisonous plants occurring on the farm unit?

d. Did any poaching incidents occur?

6.2 High Conservation Values (HCVs) 0%

a. Does the Farm Unit or the surrounding areas have any concentrations of valuable diversity, including endemic, rare, threatened, endangered or protected species of plants or animals (including CITES species)? (HCV 1; HCV 3; IGI 6.1; 6.3; 9.1)

b. Are there established trees that support pockets of biodiversity (not necessarily protected)?

c. Does the Farm Unit have any important landscapes, habitats and ecosystems that connect or contain / support viable populations of animal species that are significant at a global, regional or national level? (HCV 2; IGI 9.1)

d. Is poaching an issue on the Unit site? (IGI 6,4; 6.6)

e. Does the Farm Unit have alien species present?

f. Can the Farm Unit be seen from national roads, communities, tourism spots or areas of interest? (IGI 6.1; 9.1)

g. Do adjacent farms also practice de-bushing? (IGI 6.1; 9.1)

7. Water	0%
a. Groundwater table Details	
b. Average depth of boreholes (in m)	

7.1 Water Management 0%

7.1.1 Potable water testing	0%
a. Has potability of water been tested during the last five years?	
b. Has anyone on the farm complained about stomach issues, strange tastes or smell or colouring of the water?	

8. Waste 0%

8.1 Waste(IGI 6.3; 10.12) 0%

a. Is there a centralised dumpsite on the farm unit?

b. Does segregation of waste take place?

c. Is waste regularly covered with soil or burnt?

8.2 Waste Management 0%

a. Is old oil and chemicals disposed of in an organized way?

9. Fire 0%

9. Fire 0%

a. Is there fire fighting equipment on site and functional?

b. Are the harvesters trained on fire fighting?

c. Were there any fires that occurred on the farm in the last year?

d. Are measures in place to minimize the smoke from kilns?(HCV 4; IGI 6.3)

10. Fuel (IGI 6.1; 6.3; 10.6) 0%

a. Does storage of fuel on the farm unit occur?

b. Does refueling occur in contained areas?

c. Is there a spill kit on site available?

11. Chemicals (IGI 6.1; 6.3; 10.6)	0%
a. Are there any chemicals stored on site?	
b. Is any fertilizer being used? (IGI 10.6; 10.7)	
c. Are the employees working with chemicals trained on the correct operational procedure for chemicals?	
d. Is the chemical register complete and updated?	
e. Have there been any incidents that occurred from the use or storage of chemicals?	
f. Are all locations where chemicals were applied, indicated in the register?	
g. Is the size of the area where chemicals were applied correctly recorded?	

12. Erosion 0%

12.1 Erosion and Soil Type 0%

a. Are there places prone / likely to erosion present on the farm unit (from surface runoff, wind, barren soils, overgrazing) ?

b. Does erosion of vulnerable soils and slopes occur on the farm?

c. Is there any occurrence of erosion resulting from harvesting activities?

d. Are there places on the farm unit where topsoil has been impacted by machinery used during harvesting?

13. Use of Machinery 0%

13.1 Use of machinery and bulk equipment 0%

a. What machinery do you have on the farm? (tractors, excavators)

b. Do you use any of them for you biomass activities?

c. Are all operators of machinery provided with specific PPE?

d. Are speed limits for machinery applied?

e. Does the servicing of machinery happen in suitable containment areas?

f. Is machinery serviced at correct scheduled intervals?

14. Events 0%

a. Records of accidents, incidents, complaints and grievances?

b. Hospital / clinic / medical records updated

15. Communities 0%

15.1 Community Relations: Other stakeholders 0%

a. Local community / indigenous people present on Farm Unit (HCV 5; IGI 9.1)

b. Local community / indigenous people nearby Farm Unit

c. Local communities / indigenous people have any legal right (access, user or customary rights) to resources (IGI 3.1; 3.2; 4.1; 4.2)

d. Are there any stakeholders affected (directly or indirectly) by the operations on the farm unit, or are likely to be affected by the harvesting and charcoal activities (IGI 3.1; 4.5)

e. Engagement with or informing of local communities / indigenous people about activities on Farm Unit (IGI 3.1; 3.2; 4.1; 4.2)

15.2 Communal Lands 0%

a. Harvesting takes place on communal land

b. Producer buys charcoal from communal area

c. Producer resells purchased charcoal bought

16. Heritage	0%
a. Any known cultural, heritage, archaeological, religious or historical significace sites, resources or landscape located on farm unit (identified through engagement with local communities) that may be of local, national or international importance? (HCV 6; IGI 4.7; 9.1)	
b. Potential for undiscovered heritage remains to be found on farm unit (IGI 3.5)	
c. Unearthed remains found on other farms in the area (IGI 3.5)	
d. Any areas on the farm unit that have historical importance to the local community	
e. Any paleontological remains found on farm unit	

17. Training	0%
a. Details of Employment or Contract, including ILO Core Conventions training	
b. FSC Ps and Cs, appropriate to level of management	
c. Safety and occupational health and diseases	
d. Legal requirements for eg. for First Aid or Vehicle Operation	
e. Are employees trained on the necessary management measures for HCVs and RTEs?	
f. Gender Equality and gender discrimination	
g. Dispute resolution process and grievance process	
h. Financial Legal Requirements (Wages, deductions)	
i. Waste Disposal	
j. Forest management best practice	
k. Chain of Custody process	
l. Stakeholder Engagement	
m. Social Values (where people are affected by organization, how to identify social values)	
n. Implementation of Impact Assessments	
o. Operational Activities (Harvesting, charring and burning, silviculture, chemical application, storage and disposal of pesticides and hydrocarbons, spillages and fire fighting)	
p. Training records kept	
q. Training sessions signed by workers	

Ecosystem Services	0%

NTFP	0%






ECC-09-01-SOP-01-A

STANDARD OPERATING PROCEDURE

BIOMASS ASSESSMENT FOR BUSH UTILIZATION

May 2019

PO BOX 91193 Windhoek Namibia
Environmental Compliance Consultancy CC
CC/2013/11404

TITLE AND APPROVAL PAGE

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Confidentiality

DEFINITIONS AND ABBREVIATIONS

FSC – Forest Stewardship Council

SOP – Standard Operating Procedure

TE – Tree Equivalent

WPA – Wildlife Protection Area

1 INTRODUCTION

The perception of bush encroachment as a curse is changing to that of an economic opportunity. Whereas the restoration of rangelands would otherwise be more expensive, harvested bush can be sold as a product or used to add value on the farm to offset costs. The purpose of these bush assessments is to quantify the harvestable biomass available and identify the potential to use encroacher bush.

Depending on the vegetation, soil, conservation or other reasons, the farmers objectives vary between different areas on the farm. The assessment is customized and data evaluated according to the preferred land use.

The purpose of this standard operating procedure (SOP) is to provide a protocol for quantifying harvestable woody biomass and leaves, as well as monitoring regrowth. This will enable data to be collected in a consistent way by different surveyors, which makes the dataset more meaningful to managers and auditors.

The SOP describes the method of a biomass assessment, and contains the following sections:

- Field Assessment
- Mapping
- Data Evaluation

2 FIELD ASSESSMENT

Field assessments are conducted for two purposes:

- **Biomass Estimation** - to be able to estimate the available biomass by extrapolating the result to a larger area, for example a camp or the entire farm; and
- **Harvesting Intensity** - to evaluate whether the harvesting intensity conforms with the recommended tree equivalents for the target species, rainfall, and soil type.

The transect method for each assessment is the same and does not vary between these two purposes except for the sites selected.

2.1 BIOMASS ESTIMATION

Different sites on the farm are selected on which to perform a transect count. These sites represent a low, medium and high shrub density relative to the farm.

If available, a drone is used to verify obtain aerial images from the site and confirm that the transect will cover vegetation of similar density. Aerial photos of the site from above and of the landscape will also be useful.

2.2 HARVESTING INTENSITY

Two transects are performed for evaluating the harvesting intensity, one in a harvested area (Post-Harvest), the other in an adjacent unharvested area (Pre-Harvest).

If possible, a pre-harvest area is used as one of the Biomass Estimation sites. This will reduce the number of transects and time required on a farm.

2.3 TRANSECT COUNT

The following steps are completed in a transect count, using the field assessment sheet in Appendix A.

1. GPS coordinates, name of producer, farm name and number, long-term average rainfall, ground type, and relative shrub density are recorded, and photos of the site should be taken from the ground and/or preferably from an aerial perspective using a drone
2. A random direction along which to place a 2 m x 50 m transect is determined. The transect should not cover a disturbed or transformed area, such as roads, previously harvested areas (except for the Post-harvest count)
3. All woody plants that are rooted within the transect are counted, according to species and height class
4. For the Post-harvest area, the number of harvested stems and whether occurrence of coppicing are counted as well

3 MAPPING

A farm map is necessary in order to estimate the total available biomass per camp or farm. It is also useful as a management tool for keeping track of and planning harvesting.

The farm map includes the following:

- **Farm borders**
- **Camp boundaries** to designate harvesting areas (and non-harvesting areas). Existing roads and fences are helpful markers.
- **Excluded areas**, including cleared or converted areas, road servitudes, and, for FSC, other areas that do not adhere to FSC's criteria. For farms registering to be FSC certified, these will be marked as Pre-FSC areas.
- **Wildlife Protection Areas (WPAs)**, which are areas that will not be harvested. For FSC, these may not be less than 10% of the total farm area. WPAs include:
    - **Steep slopes** with an incline greater than 12%
    - **River beds,** with at least 100 m on each side
    - **Pans,** with a boundary of at least 10 m outside the pan's edge
    - **High Conservation Value** areas, pockets in which rare, threatened or endangered species grow or are breeding, or that play a unique role in the ecosystem, or areas that have historic and cultural value and should not be disturbed
- **Field assessment sites**, including the Biomass Estimation, Pre- and Post-Harvest sites
- **Shrub density categories**, which demarcate areas with similar biomass. These will correspond to the low, medium and high Biomass Estimation results and their respective shrub density.

4 DATA EVALUATION

4.1 On-Site Feedback

A quick assessment of tree equivalents (TEs) can be done on site, if time allows, and is included on the field assessment sheet:

1. The total TE per hectare is determined for all **targeted species** at the site:
    a. The number of targeted species per height class are added
    b. This sum is multiplied by 100 m and divided by 1.5 m for each height class
    c. These values are summed to obtain the Total Targeted TE per ha
    d. The Minimum TE is compared to the Total Targeted TE in order to obtain a rough idea of the correct harvesting intensity:
        - Minimum TE is equal to the average rainfall multiplied by 1.5 (*Acacia* spp. and *Dichrostachys cinerea*), 2 (*Colophospermum mopane*), or 3 (*Terminalia sericea*)

2. Targeted species depend on the intended use (i.e. charcoal or bush feed), and may not include protected species unless permission by the Department of Forestry can be shown (i.e. when *Colophospermum mopane* is the encroacher species)

This would enable the farmer to get a quick, quantified feedback on current or proposed harvesting.

4.2 Biomass Assessment

An Excel workbook has been set up, and must be used to determine the various results from the field assessments.

The data collected in the field, including details of the farm and sites, as well as the counts of height class equivalents, is entered into the existing spreadsheet per site.

Targeted and Non-Targeted Species

First of all, it is necessary to distinguish between targeted and non-targeted species, as the biomass estimate will only consider targeted species.

The targeted species are further divided between low and high biomass groups (Group 2 and Group 3, respectively). Different allometric scaling factors, which apply to the height classes of these groups when estimating wood and leaf biomass, have been developed by Smit *et al.* (2015), and are used to estimate wood and leaf estimates.

Tree equivalents per hectare are determined for targeted species only, and the ideal balance is determined from the average rainfall as a percentage of available TE.

Estimates and Yields

The height equivalents of Group 2 and 3 plants are used to determine the wood and leaf estimates from the targeted species, using average wood to height and leaf to height ratios (Smit *et al.*, 2015). Trees larger than 7 m are excluded from estimates.

Minimum TE per ha, converted to wood and leaf biomass (1.5 multiplied by 1.398 and 0.306 (Group 2), or by 0.966 and 0.317 (Group 3), respectively), is deducted from wood and leaf estimates to obtain the yield that is extractable without overharvesting.

The Extractable Wood Yield is further split into branch diameters according to Smit *et al.* (2015). Different sized branches may be used for different products or ecological purposes.

Charcoal is produced from stems larger than 2 cm in diameter. Depending on whether a conventional or retort kiln is used, a wood to charcoal ratio of 5 or 3 is used to obtain the amount of charcoal that can be produced.

Wood and leaf estimates and extractable yields are extrapolated to a larger area using the area's percentage of low, medium, and high shrub density, as determined by remote sensing and mapping. This is done in the farm inventory, a separate spreadsheet and record of available biomass on the farm.

Regrowth

Regrowth is only determined for Post-Harvest sites, which are monitored for regrowth by coppicing stems and seedlings. Coppicing regrowth is quantified as the percentage of harvested stems that are coppicing, and seedling regrowth as the percentage difference in 0 – 50 cm shrubs of all species between the Pre- and Post-Harvest sites.

Long-term monitoring of regrowth is performed by re-visiting the same harvested sites over a longer period.

GPS Coordinates: **S** **E** **Date:**

Producer: **Farm:** **No.** **Area (ha):**

Average Rainfall: **Minimum TE/ha*:**
* Ave Rainfall x 1.5 (*Acacia* spp. *& D. cinerea*), 2 (Mopane), **or** 3 (*T. sericea*)

Ground type: **Harvest area Pre (camp name):** **Harvest area Post:**

Pre- / Post-Harvest **Relative shrub density:** Low/Med/High

Height Class (m)	Species:				Sum of target species	Sum x height class x 100 / 1.5
< 0.5						
0.5 – 1						
1 – 1.5						
1.5 - 2						
2 – 2.5						
2.5 - 3						
3 – 3.5						
3.5 - 4						
4 – 4.5						
4.5 - 5						
5 - 6						
6 - 7						
7 – 8						
8 – 9						
> 9						
Coppiced						
Harvested						

GPS Coordinates: **S** **E**
Pre- / Post-Harvest **Relative shrub density:** Low/Med/High

Total Targeted TE:
Minimum TE / Total TE :

Height Class (m)	Species:				Sum of target species	Sum x height class x 100 / 1.5
< 0.5						
0.5 – 1						
1 – 1.5						
1.5 - 2						
2 – 2.5						
2.5 - 3						
3 – 3.5						
3.5 - 4						
4 – 4.5						
4.5 - 5						
5 - 6						
6 - 7						
7 – 8						
8 – 9						
> 9						
Coppiced						
Harvested						

Different Camps (underline if Pre- & Post-harvest sites are far from each other or different camps)
Additional Comments:

Total Targeted TE:
Minimum TE / Total TE :

Farm size as per title deed	Yes	No
Neighbour farms are indicated	Yes	No
All legal boundaries shown on map	Yes	No
Camps shown on map	Yes	No
Camp names / numbers shown	Yes	No
Camp sizes indicated	Yes	No
Waterpoints, homestead, cattleposts indicated	Yes	No
Infrastructure (roads, servitudes, airfield, pipelines, power lines)	Yes	No
Fire breaks	Yes	No
Converted areas (grass lands)	Yes	No
Water courses, pans and rivers	Yes	No
Mountains and steep slopes	Yes	No
RTEs	Yes	No
Protected areas (wildlife, nesting, excluded area)	Yes	No
Historical, cultural areas, grave sites, rock paintings	Yes	No
Location of workers' accommodation indicated on map	Yes	No
Location of current harvesting activities	Yes	No
Additional sites of concern indicated on map	Yes	No
Certified areas, areas of aftercare, previously harvested or cleared	Yes	No
Field assessment sites (pre- and post-harvest sites)	Yes	No
Pre FSC areas marked	Yes	No

100m buffer on both sides of a river, 10m around the edge of a pan

>12%

100m buffer red 30% transparency) with clear description

Must be 1 km or more away from burning operations, Must be 200 meters away from sieving operations , Water access must be within 50 meters from dwellings

e.g. erosion, alien plants

Bush Thinning Report

Project No:	
Farm Name & No:	
Owner:	
*Allowable use charcoal (t/yr):	
SLIMF/Non - SLIMF:	
Pre/Post Harvest:	
Site:	
Status:	
Pre Harvest Date:	
Post Harvest Date	
Farm Size (ha):	
Rainfall (mm):	
Soil Type:	
Transect (m²):	

Pre Harvest Data:	
Coordinates:	
Targeted TE/ha:	
Minimum TE/ha - aka Joubert:	
Minimum TE/ha - aka MET/MAWF regulations:	
Minimum ETTE/ha:	
Ideal Balance as % of Targeted TE:	
Removable TE/ha:	
Standing biomass stock (kg/ha):	
Targeted 1st time harvest potential (kg/ha):	
Total Extractable Wood Yield Potential (kg/ha):	
Charcoal Yield (t/ha):	
Targeted Leaf Yield Estimate (kg/ha):	
Total Extractable Leaf Yield (kg/ha):	
Trees with a diameter of >18 cm:	

Post Harvest Data:	
Coordinates:	
TE/ha post-harvest:	
Minimum TE/ha - aka Joubert:	
Minimum TE/ha - aka MET/MAWF regulations:	
Minimum ETTE/ha:	
Standing biomass stock after harvest (kg/ha):	
Leaf Yield Estimate after harvest (kg/ha):	
Total Leaf Yield after harvest (kg/ha):	
Trees with a diameter of >18 cm:	

Species	Numbers Pre Harvest	Numbers Post Harvest
Senegalia mellifera		
Vachellia reficiens		
Vachellia luederitzii		
Dichrostachys cinerea		
Colosphospernum mopane		
Terminalia		
Senegalia erubescens		
Grewia flava		
Grewia flavescens		

Post-Harvest Comments:	
*Allowable use (t/yr) (Comment if average used):	Average:
TE/ha after harvest **Minimum TE/ha - aka Joubert** **Minimum TE/ha - aka MEFT**	

	Pre-Harvest	Post- Harvest
Targeted TE/ha (Exclude >18 cm):	0	0
Targeted TE/ha (Include >18 cm):	0	0

* - Actual use need to be below this to qualify as SLIMF

Date	
Farm Name and number	0
Owner's Name	0
Farm Size (ha)	
Average rainfall (mm)	
Site number	
Coordinates (d m s: S/E)	S / E
Pre- / Post-harvest	Pre
Pre-harvest site density (relative):	
Transect area (m²)	100
Soil type	

TE/Rainfall Ratio	1.5
Products	Charcoal
Usable wood diameter	> 2cm
kg/TE S mellifera	10.80
kg/TE V reficiens	10.80
kg/TE D cinerea	5.07
kg/TE C mopane	4.74
kg/TE Terminalia	5.77
kg/TE Other 'Acacia'	10.80
Leaf/TE Ratio	15%
Charcoal Yield Ratio	20%
TE-height, m	1.50
Methodology:	Smit, et al (2017); Honsbein, D. (2016)

	Wood yield (%)	Year of intervention
1st Harvest Wood Yield	80%	1
First follow up harvest	44%	4
Second follow up harvest	13%	9
First aftercare harvest	1%	19
Second aftercare harvest	0%	20

Expansion/Regrowth rate	3.18%
1st Harvest rate	95%

	Height Class Equivalents																											
	Up to 0.5 m	wet-kg, < 0.5m	0.5-1 m	wet-kg, < 1 m	1-1.5 m	wet-kg, <1.5m	1.5-2 m	wet-kg, <2m	2-2.5 m	wet-kg, <2.5m	2.5-3 m	wet-kg, <3m	3-3.5 m	wet-kg, <3.5m	3.5-4 m	wet-kg, <4m	4-4.5 m	wet-kg, <4.5m	4.5-5 m	wet-kg, <5m	5-6 m	wet-kg, <6m	6-7 m	wet-kg, <7m	7-8 m	wet-kg, <8m	8-9 m	wet-kg, <4.5m
Targeted Species under SLIMF	0.5		1		1.5		2		2.5		3		3.5		4		4.5		5		6		7		8		9	>9
Senegalia mellifera		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Vachellia reficiens		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Vachellia luederitzii		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Dichrostachys cinerea		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Colosphospernum mopane		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Terminalia		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Other 'Acacia' (S. erubescens same assumptions used for *S. melifera)*		0		0		0		0		0		0		0		0		0		0		0		0		0		0
Targeted Total Height Class Equivalents	0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Targeted Wood Estimates (kg/transect)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Targeted Leaf Estimates (kg/transect)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Targeted TE	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00	
Non-targeted Species	0-0.5 m		0.5-1 m		1-1.5 m		1.5-2 m		2-2.5 m		2.5-3 m		3-3.5 m		3.5-4 m		4-4.5 m		4.5-5 m		5-6 m		6-7 m		7-8 m		8-9 m	
Grewia flava																												
Grewia flavescens																												

Targeted TE/ha (Targeted trees excluding >18cm)	0	Comment:
Minimum TE/ha - aka Joubert	0	
Minimum TE/ha - aka MET/MAWF regulations	0	
Minimum ETTE/ha	0	
Ideal Balance as % of Targeted TE	#DIV/0!	
Removable TE/ha	0	
Standing biomass stock (kg/ha)	0	
Targeted 1st time harvest potential (kg/ha)	0	
Total Extractable Wood Yield Potential (kg/ha)	0	
Charcoal Yield (t/ha)	0.00	
Targeted Leaf Yield Estimate (kg/ha)	0	
Total Extractable Leaf Yield (kg/ha)	0	

TE/ha (All Targeted trees Including >18cm)	0	Comment:
Minimum TE/ha - aka Joubert	0	
Minimum TE/ha - aka MET/MAWF regulations	0	
Minimum ETTE/ha	0	
Ideal Balance as % of Targeted TE	#DIV/0!	
Removable TE/ha	0	
Standing biomass stock (kg/ha)	0	
Targeted 1st time harvest potential (kg/ha)	0	
Total Extractable Wood Yield Potential (kg/ha)	0	
Charcoal Yield (t/ha)	0.00	
Targeted Leaf Yield Estimate (kg/ha)	0	
Total Extractable Leaf Yield (kg/ha)	0	

Date	
Farm Name and number	0
Owner's Name	0
Farm Size (ha)	0
Average rainfall (mm)	0
Site number	1
Coordinates (d m s: S/E)	S/ E
Pre- / Post-harvest	Post
Post-harvest site density (relative):	
Transect area (m²)	100
Soil type	

TE/Rainfall Ratio	1.5
Products	Charcoal
Usable wood diameter	> 2cm
kg/TE S mellifera	10.80
kg/TE V reficiens	10.80
kg/TE D cinerea	5.07
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kg/TE Other 'Acacia'	10.80
Leaf/TE Ratio	15%
Charcoal Yield Ratio	20%
TE-height, m	1.50
1st Harvest rate	95%
Methodology:	Smit, et al (2017); Hoosbeek, D. (2016)

	Height Class Equivalents																													
	Up to 0.5 m	wet-kg, < 0.5m	0.5-1 m	wet-kg, < 1	1-1.5 m	wet-kg, <1.5r	1.5-2 m	wet-kg, <2m	2-2.5 m	wet-kg, <2.5m	2.5-3 m	wet-kg, <3m	3-3.5 m	wet-kg, <3.5m	3.5-4 m	wet-kg, <4m	4-4.5 m	wet-kg, <4.5r	4.5-5 m	wet-kg, <5m	5-6 m	wet-kg, <6m	6-7 m	wet-kg, <7m	7-8 m	wet-kg, <8m	8-9 m	wet-kg, <4.5r		
Targeted Species under SLIMF (Post-harvest)	0.5		1		1.5		2		2.5		3		3.5		4		4.5		5		6		7		8		9	>9		
Senegalia mellifera		0		0		0		0		0		0		0		0		0		0		0		0		0		0		
Vachellia reficiens		0		0		0		0		0		0		0		0		0		0		0		0		0		0		
Vachellia luederitzii		0		0		0		0		0		0		0		0		0		0		0		0		0		0		
Dichrostachys cinerea		0		0		0		0		0		0		0		0		0		0		0		0		0		0		
Colosphospermum mopane		0		0		0		0		0		0		0		0		0		0		0		0		0		0		
Terminalia		0		0		0		0		0		0		0		0		0		0		0		0		0		0		
Other 'Acacia' (S. erubescens same assumptions used for *S. mellifera)*		0				0		0		0		0		0		0		0		0		0		0		0		0		
Total Height Class Equivalents	0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Wood Estimates (kg/transect)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leaf Estimates (kg/transect)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total TE	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00			
Non-targeted Species	0-0.5 m		0.5-1 m		1-1.5 m		1.5-2 m		2-2.5 m		2.5-3 m		3-3.5 m		3.5-4 m		4-4.5 m		4.5-5 m		5-6 m		6-7 m		7-8 m		8-9 m			
Grewia flava																														
Grewia flavescens																														

		Comment
TE/ha Post- harvest (including >18 cm trees)	0	
TE/ha Post- harvest (excluding >18 cm trees)	0	
Minimum TE/ha - aka Joubert	0	
Minimum TE/ha - aka MET/MAWF regulations	0	
Minimum ETTE/ha	0	Other Comment:
Total Standing biomass stock Post- harvest (kg/h	0	
Leaf Yield Estimate Post- harvest (kg/ha)	0	
Total Leaf Yield Post- harvest (kg/ha)	0	