NRMP Best Practice Strategy Document
(Revised edition from 2012 NRMPS)

Reviving Namibia’s Livestock Industry
Regenerative Livestock Production
Trends, Key Profit Drivers, Case Studies and Recommendations

Based on Namibia Rangeland Management Policy (NRMP): A 2019 Edition
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The National Rangeland Management Policy (NRMP) was approved in 2012. In 2014, the NRMPS Project was commissioned in support of this policy, under the Ministry of Agriculture, Water and Forestry (MAWF), to address the declining natural resource base in Namibia. The careful and appropriate use of soil, water and rangeland is vital for Namibia’s present and future prosperity. The NRMPS Project was designed to initiate the implementation of the NRMP in order to secure the economic basis for a growing population that depends on the sustainable management of our rangelands. As part of the NRMPS Project, the strategy was reviewed and now constitutes this strategy document, which is designed to guide implementation of the NRMP.

Namibian rangelands remain the basis of the livestock industry and livestock production. However, the Namibian livestock industry is in decline due to rangeland degradation, which is discerned by the loss of palatable perennial grasses and the increase in bush encroachment. This situation is exacerbated by climate change and the severe droughts that Namibia has experienced over the past two decades. Without the security of a healthy natural rangeland resource, the livestock industry will not have the basis to sustainably support livestock production; consequently, the entire livestock value chain will be tested during the coming decade.

The key to increasing income and reducing poverty is to enhance agricultural production at farm and household levels in a sustainable manner. This will require approaches that support regenerative rangeland practices, as well as fodder production and trials of new innovations such as hydroponics. The MAWF continues to call upon all stakeholders to rededicate their efforts in putting this strategy document into effective, practical use. Under the guidance of the MAWF, the three Namibian Farmers Unions (Namibia National Farmers Union, Namibia Emerging Commercial Farmers Union, Namibia Agricultural Union) were specifically tasked to create increased awareness regarding the importance of improved rangeland management; identify the key principles of profitable livestock management; and identify the proven best practices that improve livestock production and profitability. Lastly, the unions and consultants were requested to review mechanisms to incentivise the uptake of these best practices, and to review how best to support farmers in order for them to learn about and adopt new practices.

This strategy document, which is the product of four and a half years of work, presents the findings and recommendations for revitalizing the livestock industry in Namibia. It confirms the dire state of our rangelands and industry, but it also offers practical solutions to farmers and decision makers to help guide Namibia out of the present undesirable state towards one that will contribute significantly to the country’s prosperity.

The development of this strategy document on rangeland management comes at a critical time. The Namibian government, stakeholders and other partners are taking note of the importance of rangelands. The Namibia Rangeland Management Policy and Strategies, if fully applied, will contribute significantly to the Sustainable Development Goals, Namibia’s Vision 2030, and the National Development Plans.

The three Namibian Farmers Unions and stakeholders hope and anticipate that this strategy document will transform the mind-set of farmers towards adopting sustainable rangeland principles, which will create resilience among farmers to climate change and ensure sustainable livestock production.

This strategy document is not the end; instead, it is the start of a long journey. A journey that still needs to see the engagement of the entire sector to enable farmers to recover from the precarious situation they currently find themselves in. We have prepared a way forward beyond the NRMPS Project and this strategy document, and we will, in conjunction with the sector, undertake further activities to achieve the full implementation of this critically important process.
Increased land-based productivity and profitability must drive Namibia’s economic revival. Sixty-four million ha of Namibia is suitable and is used for livestock farming. The sustenance produced from livestock farming supports 1.2 million Namibian’s in over 200,000 households. More than a quarter of Namibian households depend largely on agriculture and 90% of agricultural land is best suited for livestock production.

However, the total contribution of agriculture has declined to 5% of Namibia’s GDP, and Namibian rangelands can now only sustainably stock half the number of animals than they could in the 1950s. Rangeland degradation negatively influences the livelihoods of a large portion of the Namibian nation, and it results in a downward trend in the ability of farmers to live off the land and produce food for own use and export. The continued degradation of rangelands has, in particular, a negative impact on the profitability of livestock farming; it affects tourism; and it impacts the Namibian economy as a whole, which contributes significantly towards increasing levels of poverty.

The major reason for rangeland degradation is the application of poor rangeland management practices throughout the rangelands of Namibia, which includes title deed farmland, and communal and protected areas. In response, the Namibian government developed the National Rangeland Management Policy (NRMP). If the NRMP is applied throughout the country, it will add N$4 billion per annum to Namibia’s GDP. This contribution is both possible and feasible, and it can restore the sustainable stocking rates to at least those of the 1950s. However, it will require a sector-wide approach for the implementation of the National Rangeland Management Policy (NRMP) and the recommendations in this strategy document.

In support of the NRMP, the Ministry of Agriculture, Water and Forestry (MAWF) and the European Delegation to Namibia under the EDF10 Call for Proposals funded the National Rangeland Management Policy and Strategy (NRMPS) Project (from April 2015 to September 2019), which, under the guidance of the MAWF, was led by the three Namibian Farmers Unions.

During the project period and with the MAWF’s support, the three Namibian Farmers Unions (Namibia National Farmers Union, Namibia Emerging Commercial Farmers Union, Namibia Agricultural Union) organised and held farmer-led regional and national working group meetings. During these meetings, the farmers agreed that the livestock industry in general and livestock farmers throughout the country are in serious trouble.

Most parts of Namibia no longer have healthy soils with high microbial activity; they have lost nett primary productivity and soil carbon and are now losing soil moisture. The current extended drought has made livestock farmers in the cattle, sheep, goat, and game industries realise the importance and value of healthy and productive rangelands. Farmers are paying a high price for not investing adequately in the rangeland resource. All unions have recognised that the resource base has declined drastically and that we are only able to stock a third of what we could 50 years ago. Work completed by Agri-Ecological Services confirms that the resource base has declined and that bare ground throughout Namibia has increased over the last 20 years. In addition, approximately 60 million ha of Namibia’s rangelands have lost good perennial grasses and 45 million ha of these have lost additional productivity as a result of bush thickening. Some of the Northern Communal Areas (NCAs) have been classified as having the highest woody cover in the country, which supports the need for promoting sustainable bush thinning activities.

Landscape rehydration is required in areas where erosion occurs and must also accompany sound rangeland management practices. If bush thinning is addressed and followed up with regenerative rangeland management practices, we could add at least N$3 billion to our GDP annually. This approach will have a major impact in the communal and title deed areas of Namibia. These efforts will need to be complimented by fodder production and trialling new innovations such as hydroponics.

All unions agreed that farmers themselves can control two major aspects to improve profitability. The first is to assist farmers with reducing the cost of production per animal produced, and the second is to increase the sustainable productivity of the land over time. Farmers that sustainably produce more products per hectare, at a cheaper price, will be more profitable in the future. Farmers that do not make the changes needed to do this may either soon go out of business or increase farm subsidies with off-farm income. It was also agreed that in terms of farmers’ profitability, increasing sustainable stocking rates by applying
sound rangeland management practices is eight times more important than any other factor. In addition, the farmers and the MAWF technical staff agreed that case study evidence from Namibia and beyond evidently shows that reversing our current degradation is not only possible (i.e. we know how this can be done), but it is also hugely profitable for the farmer and vital for the growth of the livestock sector as a whole.

All unions and representatives agreed that farmers throughout the country are currently under huge strain and that making the changes required for success is not easy. To support the required changes in farmers’ practices, the national working groups and stakeholders considered and agreed to various ways of supporting and encouraging farmers to make these changes. One way includes contributing to the development of a comprehensive transformative support programme, starting in the Northern Communal Areas, which involves opening local, national and international markets, value addition, as well as mechanisms that will enable the enforcement of grazing plans in the communal areas. All unions have developed proposals for taking key activities forward. These proposals include the development of regenerative livestock production price premiums. These premiums need to be linked to markets, but the industry also realises that Namibia as a whole must invest into the future success of the industry to help farmers get their productivity back to the levels enjoyed 50 years ago. The banking sector will also need to play a key role in supporting farmers through these tough times with strategic affordable assistance regarding bush thinning, restocking, water infrastructure, fencing, etc., based on business plans that enable profitable regenerative agriculture to be kick-started.

Changes on a national level are also required. The support to livestock production within the MAWF and the three unions needs to be adequately resourced if these plans are to be realised. It is also vital in the future that all responses to national and regional forage shortages consider the need for large-scale destocking (followed by restocking after the rains). Many farmers throughout the country will need assistance with restocking, which is vital for kick-starting their farming businesses. This will speed up the recovery of the national herd and will enable the industry to meet its obligations, including fulfilling international market quotas. However, it is very important to point out that when the current drought ends, the animal numbers in many parts of Namibia will be too low, particularly in those areas where bush thinning has taken place. Remember, in dry climates well-managed ruminants are a vital part of the regenerative process. Restocking Namibia while applying regenerative rangeland management will be a vital part of kick-starting the economic revival of this sector. Many other changes are required to revitalise the sector, including the development of tax incentives that facilitate the growth of the industry.

This strategy document, produced by the NRMP Best Practice Project, will hopefully assist farmers and decision makers to begin making the changes towards becoming a more productive and profitable livestock sector. The aim to engage the participation of the entire livestock industry remains, and if successful, Namibia can mitigate the impacts of climate change; produce higher quantities of healthy, high quality meat products, while being increasingly profitable and carbon-friendly; and rejuvenate ground water supplies that farmers and cities rely on. The success of the livestock sector will play a key role in the revitalisation of the entire Namibian economy.

The future of the livestock sector depends on livestock farmers throughout the country changing their practices, and these changes need to be in line with this strategy. It also requires a broad response from the industry to enable and enhance the uptake of regenerative practices. This strategy document identifies existing harmful interventions of the industry that need to be removed, and also identifies appropriate incentives that will encourage and enable farmers to change. The main incentives required include an enabling framework for communal farmers to apply and enforce a grazing plan, and market-driven price incentives that support and encourage regenerative and organic farming methods. Lastly, an industry-driven way forward is proposed, which will complement existing extension support and also enable many more farmers to be more effectively reached.

Mr Percy W. Misika
EXECUTIVE DIRECTOR
Ministry of Agriculture Water and Forestry

Funded by: 

 Implemented by: 

EUROPEAN UNION  
NAMIBIA NATIONAL FARMERS UNION (NNFU)  
NAU / NLU
AUTHORS

The following people formed part of the Technical Committee that was responsible for drafting this strategy document and incorporating comments and inputs from the stakeholders:
1. Colin Nott (Coordinator – NRMP)
2. Jerome Boys (Senior Agricultural Scientific Officer – DARD/MAWF)
3. James Nzehengwa (Chief Agricultural Scientific Officer – DAPEES/MAWF)

ACKNOWLEDGEMENTS

The working groups from the three unions (Namibia National Farmers Union, Namibia Emerging Commercial Farmers Union, Namibia Agricultural Union) are highly acknowledged for their input at local and national levels. The Rangeland Advisory Committee (RAC) is acknowledged for the provision of overall guidance to the NRMP-S Project. The funding and support provided by the MAWF and the EU Delegation to Namibia under the EDF10 Call for Proposals has made this initiative possible. The NAU is recognised for applying for the funds and providing project management support to the project.

Acknowledgement and thanks are also given to the farmers and technical experts for sharing their knowledge and experiences during the 2018 Rangeland Forum.

Although many people formed part of the stakeholder engagement process, the following individuals played a vital role in the development and publication of this strategy document through inputs, comments, and material used in this document:
1. Mildred Kambinda (MAWF)
2. Issaskar Mate (MAWF)
3. Joseph Hailwa (MAWF)
4. Cornelis van der Waal (Private Consultant)
5. Bertus Kruger (Private Consultant)
6. Daisy Nheta Manungo (NNFU)
7. Roelie Venter (NAU)
8. Richard Kamukuenjandje (NUST)
9. Mecki Schneider (Chairman RAC)

Thank you to Ibo Zimmerman (NUST) for reviewing the content, Marie Louise Mott-Adams for editing the content, and AgriForum for designing and printing this document.

ACRONYMS AND ABBREVIATIONS

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<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tbody>
<tr>
<td>CO₂</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>COP</td>
<td>Cost of Production</td>
</tr>
<tr>
<td>DAPEES</td>
<td>Directorate of Agricultural Production, Extension and Engineering Services</td>
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<tr>
<td>DARD</td>
<td>Directorate of Agricultural Research and Development</td>
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<tr>
<td>EDF</td>
<td>European Development Fund</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>ha</td>
<td>hectare(s)</td>
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<td>kg</td>
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<tr>
<td>MAWF</td>
<td>Ministry of Agriculture, Water and Forestry</td>
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<td>NAU</td>
<td>Namibia Agricultural Union</td>
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<td>NCAs</td>
<td>Northern Communal Areas</td>
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<td>NECFU</td>
<td>Namibia Emerging Commercial Farmers Union</td>
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<td>NNFU</td>
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<td>NRMP</td>
<td>National Rangeland Management Policy</td>
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<td>NRMP-S</td>
<td>National Rangeland Management Policy and Strategy</td>
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<td>RAC</td>
<td>Rangeland Advisory Committee</td>
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<td>SADC</td>
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The Namibian livestock industry is in decline. Numerous publications describe the large-scale loss of palatable perennial grasses and the occurrence of bush encroachment, and Namibia is regarded as a country that will be severely affected by climate change. With the emergence of declining farm profits, more frequent man-made droughts, a decline in animal numbers reaching the markets and severe environmental concerns, it became clear that the decline in Namibia’s rangelands requires urgent attention.

As a result, the Ministry of Agriculture, Water and Forestry (MAWF), together with industry partners, initiated and developed an innovative rangeland policy that, if implemented fully, will make an additional N$4 billion annual contribution to Namibia’s GDP. This increased profitability and productivity of the sector will have a major impact on the 70% of the population that depends directly or indirectly on the rangeland resource for their economic well-being and food security. For 60 million hectares of Namibia’s arid farmland, turning lignified grass into protein and money is the best, if not only, land use option available. If the livestock industry is developed as indicated in this strategy document, it will have a carbon-friendly footprint and it will contribute positively to dietary needs.

The former Minister of Agriculture, Water and Forestry (Hon. John Mutorwa) states in the preface of the Namibia Rangeland Management Policy (NRMP) that “without the security of a healthy natural rangeland resource, the agricultural sector will not have the basis to sustainably produce raw material for secondary industry development.” This statement emphasises the importance of dealing with the full livestock value chain, from growing more grass cheaply to producing more kilograms of produce per hectare, to enable added value and job creation within the country.

For the remainder of this century, climate change will result in Namibia’s climate becoming warmer and dryer. This will further decrease rangeland productivity and make farmers more vulnerable because droughts will become more frequent and more severe.

The implementation of the best and sound rangeland management principles arising from the NRMP will afford the potential of mitigating the impact of climate change, increasing employment, enabling ‘growth at home’, increasing throughput of slaughter facilities, improving meat quality, reducing man-made droughts in Namibia, improving rural people’s quality of life, and improving ground water supply for Namibian farms and towns. Moreover, Namibia’s 60 million hectares of rangeland presents a major opportunity to restore carbon back to the soil.

Soil organic carbon is enhanced by increased levels of dead plant material in the soil, thereby improving the structure of the soil. Improved soil structure increases water infiltration, which ensures the recharging of ground water and better plant growth. Improved soil structure, increased water infiltration and higher plant cover is crucial for the health of all soil. Healthy soil can hold more water than all our rivers and dams combined, and it can support greater biodiversity than we currently have. Moreover, healthy soil is the key to profitability for livestock farmers because more grass can be grown for the grazing livestock industry of Namibia. Although cattle, which are grazers, are the predominant livestock in Namibia, the approaches presented apply equally to all grazers and browsers (small stock, large stock and game). It is also important to assess the type of livestock you have based on what your farm produces. For example, if you have large amounts of bush at an available height, then utilising this bush to make money is the key, and goats should be considered as part of the management options to increase profit and production per hectare on your farm.

**Purpose of this strategy document**

This strategy document was developed in consultation with farmers and regional and national farmers’ working groups, under the guidance of the Namibian farmers unions (NNFU, NECFU and NAU) and the MAWF, to provide farmer-driven practical solutions for mitigating the impacts of climate change, while enabling continual increases in production and profitability of livestock farming in Namibia.

This strategy document provides the following information:

1. **Background on the status of the Namibian rangelands and livestock industry**, which includes:
   - The importance of soil health
   - The basic needs of forage plants
   - The impact of climate change
   - Key drivers of improved livestock production and profitability

2. **Best practices around rangeland management**

The NRMP provides the framework that supports various approaches outlined in this strategy document to create a thriving livestock industry and a healthy ecosystem.
**1. BACKGROUND OF NAMIBIAN RANGELANDS AND THE LIVESTOCK INDUSTRY**

**1.1. Current status and trends in Namibian rangelands**

Poor rangeland management has resulted in the loss of highly palatable perennial grasses over most of Namibia’s 60 million hectares of rangeland where livestock is present. Forty-five million hectares of this total rangeland accessed by livestock has been encroached by bush (see Map B).

Compared with the 1950s, many areas now require three times the area in order to sustain the same number of animals due to this loss of perennial grass and increased bush.

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**Map B:** Bush-encroached areas in Namibia

Bare ground is an important indicator of ecosystem health and productivity. A high bare ground percentage relates to an increased risk of water run-off and water erosion, and high evaporation rates. This means that less water penetrates the soil, which jeopardises the growth of plants and the recharging of underground water supplies. Bare ground is measured in September every year, when it is expected to be most pronounced. Map C shows that over the last 18 years bare ground has on average increased within Namibia. The areas where bare ground has increased most severely (with few cases of improved soil cover) include large parts of the Kunene and Karas regions.

From 2015 to 2018, communal areas have, on average, had the highest bare ground. Communal area bare ground was 14% higher than emerging farmer study units. In the same time frame, bare ground in the communal areas was most pronounced in the semi-arid zone compared with title deed and emerging study sites.

For title deed land, differences in soil cover between 2015 and 2018 were also apparent. The arid zone farms, with cattle as the primary land use, had on average 17% less bare ground than the tourism land use, 15% less than small-stock, and 11% less bare ground than study units where game farming was the primary land use. In the semi-arid zone, farms where small stock was the primary land use had on average 25% more bare ground than cattle, and 17% more bare ground than on game farms. In the sub-humid zone, tourism, small stock and game sample sizes were too small (n<15) for comparison with cattle farming. Nevertheless, cattle farms in the sub-humid zone had, overall, the lowest bare ground fraction of all comparisons.

Map D shows the observed 2015 to 2018 amount of bare ground in relation to the bare ground expected for each area’s long-term rainfall. An example of a naturally high bare ground relative to the long-term rainfall of an area is the Etosha pan system (Point 1 on Map D), where very little or no plant growth is possible. Bare ground hotspots were apparent in the north-central communal areas (Point 2 on Map D), which are most likely a result of...
extensive croplands with low soil cover and overgrazing. Points 3, 4, 5, 6 and 7 are in communal areas and are most likely the result of poor rangeland management practices. Point 8 in the title deed areas of the southern Kalahari and the areas around Otjiwarongo are also most likely the result of poor rangeland management practices. The Bwabwata and Zambezi region also has high bare ground areas, which are most likely a result of high fire frequencies.

In addition to changes in bare ground over time, it is also important to consider changes in grass cover as well as plant material on the soil surface. Good herbaceous (grasses and forbs) cover is crucial for preventing erosion and for recharging under-ground water supplies as it increases water infiltration and deep percolation. This conservation of water also increases plant production, and the health and productivity of the land. Herbaceous cover is measured at the end of May when it is expected to be at its highest. In 2018, arid area title deed study units had on average the highest herbaceous cover, followed by the emerging farming study units. Communal areas had the lowest herbaceous cover in both the arid (46% lower than title deed) and semi-arid zones (13% lower than title deed), but were similar to title deed and emerging farmer study units in the sub-humid zone.

In addition to bare ground and herbaceous cover, it is also important to consider changes in forage production. This is a vitally important management tool. Herbaceous biomass estimates at the end of the rainy season need to be used annually to calculate the dry season forage flow. This allows farmers to determine how much forage remains for utilisation until more rain in the following season can be expected. The amount of forage in relation to the number of animals on a given piece of land allows the farmer to determine whether a forage deficit or a forage excess exists for a given season. This enables fast decision making regarding destocking or restocking. Good
forage production predictions were possible for the arid parts of Namibia, but not the north eastern part of Namibia. Forage production data for the eastern and northern areas was found to be inadequate and is therefore not shown. Seasons 2015/16, 2016/17, 2017/18 and 2018/19 are included in Map E.

It is clear from the 2018/2019 Season map that production was low, which resulted in the declaration of a national disaster pertaining to drought. Farmers have also been using this data at farm level to assist with their management decisions relating to annual adjustments of stocking rates. Title deed study units had on average a 46% higher herbaceous biomass estimate compared with communal study units, but only a 5% higher herbaceous biomass compared with emerging farmer study units. Arid study units had on average an end-of-season herbaceous biomass of 101 kg/ha, while semi-arid study units had 499 kg/ha. One major symptom of poor rangeland management is bush thickening.

To date, many maps produced have not indicated the high bush densities in the Northern Communal Areas. Map F clearly shows that some of the highest woody cover in Namibia is found in the Northern Communal Areas (NCAs). Regenerative rangeland efforts need to engage in the utilisation of bush in a sustainable manner, in line with the recommendations of this strategy document. There is major scope for enhancing livelihoods through the sustainable use of bush products. The woody cover on title deed field sites was 26% lower than on communal sites, and 22% lower than the average field sites on emerging rangeland sites.

All areas showed low perennial grass cover (title deed sites had an average of only 20%, and communal and emerging sites just above 10%). Field measurements taken on title deed study units showed 89% higher perennial grass cover than on communal land, and 71% higher perennial grass cover than on emerging study units during 2018.

The current state of Namibia’s rangelands shows higher levels of bare ground, lower levels of herbaceous cover, lower perennial grass cover, and higher bush densities over large areas. None of these scenarios are desirable for profitable livestock farming. With regard to title deed areas (which are both able to enforce grazing plans), in all cases private lands were in better condition than emerging farms (even though there are considerable variations in rangeland condition between farms). However, in general, communal lands were in the worst condition because grazing plans cannot yet be enforced. It is clear that the annual forage production at local, regional and national levels has declined, and it is reported that forage shortages are becoming more frequent and the impact on farmers more severe. It is expected that these circumstances will be intensified over time by the impacts of climate change.

The findings of the NRMP show that rangelands are in decline throughout all land types in the country, and all the indicators confirm this. The overall indication is that nett primary production of rangelands is in decline. Considerable amounts of soil carbon have been lost from the soil and the micro-biome of the soil is severely compromised – both of these constitute a vital component of soil health and productivity. Soil cover has reduced and moisture loss from the soil surface has increased significantly. Soil that is covered all year round has a significant impact on soil carbon and soil microbes, which make water and nutrients available to plants.

1.2. Current status of the Namibian livestock industry

Farmers throughout Namibia have reported a decline in sustainable stocking rates, decreased profits, and increased risks and impacts of drought. This is particularly noticeable in certain areas which in the 1950s only needed 10 hectares to support one large stock unit, but now require 30 hectares to support the same-sized stock unit. In addition to declining sustainable stocking rates, input costs have increased faster than income.

Map F: Woody cover in central and northern Namibia (2019)

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Map F: Woody cover in central and northern Namibia (2019)

To date, many maps produced have not indicated the high bush densities in the Northern Communal Areas.

Map F clearly shows that some of the highest woody cover in Namibia is found in the Northern Communal Areas (NCAs). Regenerative rangeland efforts need to engage in the utilisation of bush in a sustainable manner, in line with the recommendations of this strategy document. There is major scope for enhancing livelihoods through the sustainable use of bush products. The woody cover on title deed field sites was 26% lower than on communal sites, and 22% lower than the average field sites on emerging rangeland sites.

All areas showed low perennial grass cover (title deed sites had an average of only 20%, and communal and emerging sites just above 10%). Field measurements taken on title deed study units showed 89% higher perennial grass cover than on communal land, and 71% higher perennial grass cover than on emerging study units during 2018.

The current state of Namibia’s rangelands shows higher levels of bare ground, lower levels of herbaceous cover, lower perennial grass cover, and higher bush densities over large areas. None of these scenarios are desirable for profitable livestock farming. With regard to title deed areas (which are both able to enforce grazing plans), in all cases private lands were in better condition than emerging farms (even though there are considerable variations in rangeland condition between farms). However, in general, communal lands were in the worst condition because grazing plans cannot yet be enforced. It is clear that the annual forage production at local, regional and national levels has declined, and it is reported that forage shortages are becoming more frequent and the impact on farmers more severe. It is expected that these circumstances will be intensified over time by the impacts of climate change.

The findings of the NRMP show that rangelands are in decline throughout all land types in the country, and all the indicators confirm this. The overall indication is that nett primary production of rangelands is in decline. Considerable amounts of soil carbon have been lost from the soil and the micro-biome of the soil is severely compromised – both of these constitute a vital component of soil health and productivity. Soil cover has reduced and moisture loss from the soil surface has increased significantly. Soil that is covered all year round has a significant impact on soil carbon and soil microbes, which make water and nutrients available to plants.

1.2. Current status of the Namibian livestock industry

Farmers throughout Namibia have reported a decline in sustainable stocking rates, decreased profits, and increased risks and impacts of drought. This is particularly noticeable in certain areas which in the 1950s only needed 10 hectares to support one large stock unit, but now require 30 hectares to support the same-sized stock unit. In addition to declining sustainable stocking rates, input costs have increased faster than income.
and land prices have increased dramatically. Over time, farming livestock has become riskier and less profitable. Cattle farmers have to be 7% more efficient each year and sheep farmers 2% more efficient each year in order to maintain the same level of profitability. Farmers need to review their practices and make careful adjustments to ensure that they remain profitable into the future. Profits have been further reduced through the introduction of higher input cost animals that do not perform well on a declining resource base. The fact that land prices have increased and the ability to invest in improved production and pay off loans has declined, farmers have had to diversify their farming activities in order to generate more incomes. In addition to this, farmers are increasingly using salaried income to subsidise farming activities, which is a new and worrying trend in the farming industry.

In addition to the difficulties previously listed, the Namibian and SADC livestock markets are unable to cope with increased sales that are required during national and regional livestock forage shortages. In the Northern Communal Areas (NCAs) this is further aggravated because of a lack of formal livestock markets. The consequence of this is that farmers keep their animals on the rangelands instead of selling them, which results in a further decline of the rangeland resource base and decreases sustainable stocking rates.

Since forage growth is dictated by effective rainfall, Namibia will always experience either an excess of forage or a shortage of forage. It is therefore important that Namibian livestock markets respond accordingly: either increase or reduce off-take. As the communal areas in Namibia have no formal legislative environment in which to implement and enforce a grazing plan, this causes the livestock industry in these communal areas to be unsustainable.

In all parts of the country, Namibian livestock farmers find themselves in a situation where the ‘terms of trade’ in the livestock sector are in decline. Under these conditions, it is becoming more and more difficult to produce livestock profitably.

Considering all of these damaging practices and environmental circumstances that stand against productive livestock farming, it is important to be aware of the loss that the country and its people, particularly farmers, experience as a result. If all these issues were to be addressed, Namibia would gain N$3 billion per annum. If livestock farming is to remain competitive and sustainable in an increasingly competitive world market, farmers must change their practices at the producer level and the market environment needs to be aware of the producers’ needs and seek solutions that are appropriate for the Namibian environment and farmers. To support and encourage this transition, enabling policies, incentives and support programmes must be established.

The statistics so far indicate the extent of degradation in Namibia, as well as the extent of its impact on farmers and on a national level. Monthly forage production figures provide important feedback for farmers and they assist regional and national decision making processes. Forage availability in relation to current stocking rates enables a forage surplus or deficit to be identified early on in the season. This enables quick and effective management responses that reduce the risk of the livestock business, and it triggers regional and national support mechanisms that are intended to support the growth of the industry.

1.3. Impact of climate change on rangelands and the livestock industry

In particular, the variability in rainfall and rising air temperatures can cause shifts in vegetation dynamics and influence the adaptability of livestock. It is evident that land degradation is caused by poor rangeland management, and accelerated by climate change. Low rainfall, high temperatures and increased carbon dioxide levels favour woody plant growth. Woody plants are in most cases already established, but herbaceous plants are under continuous pressure from being grazed, which has resulted in their declining state.

The southern and western parts of Namibia experience higher variability in rainfall compared with the northern and eastern parts (see Map G).

Map G: Variation in annual rainfall (2010)

Productivity of rangelands and recovery periods after grazing will therefore vary in the different parts of Namibia. It is anticipated that climate change will have a prominent impact in the south and west, and less impact in the north and east. Therefore, the northern and eastern areas must be targeted for increased production and profitability per hectare through the most appropriate land use means available.

The variability in rainfall and projected mean annual rainfall throughout Namibia illustrates that the bigger portion of Namibia’s land surface area is becoming drier (see Map H). The maps also indicate that the impact of climate change decreases in a north-easterly direction.

In order to build resilience against the variability of rainfall, plant cover will have to be improved, particularly through the application of sound rangeland management practices and adjustable stocking rates. In this way, moisture can be used more efficiently in terms of kilograms of plant material produced per
millimetre of rainfall. This will lead to better livestock production under variable climatic conditions.

1.4. Soil health, soil carbon and biodiversity for increased livestock production

The decreased productivity, and therefore profitability, of Namibia’s rangelands is a direct result of poor rangeland management, the loss of biodiversity, and the loss of carbon from the soil. As a result, bush thickening has occurred and the number of undesirable woody species has increased. This increase leads to direct competition for moisture with desirable forage species and detrimentally influences the health of the soil. Livestock profitability is about increasing soil health and soil carbon. Soil cover and plant diversity are good indicators of soil health. The greater the diversity of plants, the greater the diversity of microbes will be. This increases available nutrients to plants and results in a more robust and productive soil ecosystem.

Available nitrogen from plants in the soil is vital for soil productivity. Fortunately, the atmosphere contains 78% nitrogen. The key to productive and profitable farming is to create, through the establishment of bio-diverse rangelands, a soil environment that supports the presence of free-living and associative nitrogen-fixing soil microbes. It is these microbes that increase the availability of nutrients to plants. microbes are associated with every kind of crop and pasture plant, including grasses and non-leguminous herbs. In well-functioning soils, 85-90% of plant nutrient uptake is facilitated by microbes.

Serious concerns associated with the impact of the livestock sector on global climate change have been raised, particularly the possible impacts of methane produced by livestock on global warming. However, it has also been indicated that when a complete life-cycle analysis of the livestock industry is done, it reveals that rangelands managed according to the principles included in the National Rangeland Management Policy (NRMP), including appropriately managed and rotationally grazed perennial grasslands, can result in more atmospheric carbon being returned to the soil as stable humus than is being emitted by livestock. In addition, as soil carbon declines the soil structure and its porosity decreases, which obstructs infiltration and worsens the intensity of flooding. Carbon in the soil improves the soil structure, which leads to an increased water-holding capacity. This increased water-holding capacity reduces runoff and flooding and increases plant productivity.

Perennial grass-species are the foundation of resilient rangelands – especially under dry climatic conditions. The health of a grass tuft’s root structure determines the production efficiency of that tuft. The health of the tuft is affected by grazing as well as the soil micro-biome. Appropriately managed rangelands have the potential to allow perennial grasses to re-establish, returning more atmospheric carbon to the soil as stable humus than is being emitted by livestock. Grass-fed livestock merely recycle carbon, as do all living things, including people. It is not possible for any animal to add ‘new’ carbon to the atmosphere. Carbon dioxide (CO$_2$) emissions from grain-fed beef, however, can be high. This is due to the fossil fuel required for the production, distribution and application of synthetic fertilisers for grain production. In terms of human health, research has shown that grass-fed beef has a more balanced omega-6 to omega-3 ratio than grain-fed beef, which suggests that many of the health concerns associated with red meat consumption relate principally to grain-fed beef.

A carbon-friendly beef enterprise is more than just possible, it is essential. Appropriately managed grazing is a strong tool for the improvement of nutrient cycles, enhancement of soil water-holding capacity, restoration of biodiversity, oxidation of methane, and for soil carbon sequestration and catchment health. But above all, beef producers are food producers, and grass-fed beef provides healthy, mineral-dense food that contains an excellent balance of essential fatty acids.

In addition, as soil carbon declines the soil structure and its porosity decreases, which obstructs infiltration and worsens the intensity of flooding. Carbon in the soil improves the soil structure, which leads to an increased water-holding capacity. This increased water-holding capacity reduces runoff and flooding and increases plant productivity.

About 450 Giga tons of the 550 Giga tons of carbon on planet earth is in plants. Microbes make up 93% of the remaining 100 Giga tons. Seven per cent of all other life makes up the remaining carbon in living organisms (including all fish, insects, animals and humans). Humans make up 0.01% of the biomass of life on earth. We are embedded in a plant and microbial world and we are discovering the vital role microbes play for everything’s functioning (ruminant gut function, human gut function and soil productivity restoration). We and our farms are interdependent with microbes as they are in, on and around us. – Christine Jones

Trends in soil carbon provide an excellent indicator of soil health. If carbon levels are trending down, levels of stable organic nitrogen, mineral and trace element availabilities, and soil porosity and structure will decline. If carbon levels are trending up, levels of...
stable organic nitrogen, mineral and trace element availabilities, and soil porosity and structure will improve.

Above- and below-ground biodiversity creates a robust soil micro-biome that increases soil carbon sequestration and carbon storage capacity; improves aggregate stability, soil structure and function; enhances the capacity of the soil to act as an effective bio-filter; evens out feed availability throughout the year; maintains or improves herbage yield and livestock production; and optimises soil, plant, animal and human health, as well as water quality and farm profit.

The presence of year-long diverse ground cover is the most important factor for soil health. Living plants support the microbes that create well-structured, friable (soil that can be easily crumbled) topsoil with a high nutrient status and water-holding capacity.

As well as improving catchment health, water quality and many ecosystem services, healthy soils also underpin high-yielding agricultural production and farm profit. In the same way that it is important to ‘feed the rumen and not the cow’, it is also important to ‘feed the soil micro-biome and not the plant’. The future prosperity of the Namibian nation will require ecologically sound agricultural production. Enhanced above- and below-ground diversity may well provide the key to the restoration of profitable, environmentally-friendly farming. The costs involved in transforming high-input low-diversity rangelands to low-input species-rich multifunctional rangelands is considered viable and will generate benefits at the local, regional and national levels.

Providing the necessary enabling environment, incentives, and technical and financial support to farmers in order to develop and implement a whole-farm approach to restoring soil biodiversity is the key to Namibia’s growth of the agriculture sector. Similar to research that is being done regarding the human gut micro-biome, understanding and supporting the functioning of the soil micro-biome is being increasingly recognised as the future for agriculture. Restoring Namibia’s rangeland productivity and profitability is no different.

As illustrated in Figure 2, it is clear that many of the microbes important for soil and plant function have been lost due to low soil cover and low soil moisture. This strategy document provides the mechanisms for re-establishing microbes and plant diversity through incentivising accredited rangeland management practices with effective technical and financial support. Lessons from producers throughout the dry climates of the world, who have achieved large improvements in soil health and sustainable stocking rates, have been drawn on and are included in this document.

1.5. The non-negotiable needs of forage plants for increased livestock production

Perennial grasses and palatable shrubs have two non-negotiable needs. These non-negotiable needs include the following:

1. Perennial grasses and shrubs must be grazed, and therefore stimulated, in the growing season (rainy season) in a way that allows enough time for the energy in their root reserves to recover before being grazed again. The intensity of utilisation of plants by animals determines the amount of time required by the plants to at least recover their root reserves before being grazed once more in the growing season.

   This principle enables some grazing methods to propose full growing season utilisation, followed by one (or even two) full growing season recovery period in the years following the grazing. Other approaches that ‘take one bite’ during the growing season may allow the recovery period to be as little as 35 days. Farmers need to understand this relationship, because in dry variable climates, growth rates vary within and between seasons, and sound management needs to account for adjusting recovery periods when needed.

   If grazing takes place repeatedly over time in the growing season without allowing sufficient time for the plants to recover, which involves allowing photosynthesis to replenish the root reserves, the roots will become depleted and the forage plants will eventually die.

2. Perennial grasses must be grazed each year in the non-growing season (dry season). This ensures that growth points are exposed to the sun in the next growing season, and that soil cover increases over time in order to improve the water cycle for the next growing season and to feed the microbes in the soil. Clearly, forage must be put aside as a
drought reserve to account for late rains or very poor rains in the following season. This drought reserve forage can be left in separate camps or it can be distributed as standing matter throughout all the camps. In order to gradually increase stocking rate, needs 1 and 2 of forage plants must be applied on the farm over time. However, a balance must always be maintained between increased sustainable stocking rate, plant recovery and animal performance. Animal performance keeps the farmer in business; therefore, it is important for farmers to ensure that this critical factor is not compromised.

To be able to apply these two non-negotiable needs of forage plants, farmers in variable climates will need to adjust animal numbers to avoid overgrazing or over-resting forage plants. Therefore, in order to ensure that forage plant reserves improve over time, Namibia considers adjusting animal numbers upwards in times of forage excess and temporarily downwards in times of forage shortage. This will allow the sustainable stocking rate to increase over time. It is important that every farmer does this.

It is also important that the livestock market responds quickly to severe regional and national forage shortages in order to support farmers with reducing numbers when needed. Farmers also need to be supported with restocking after droughts, for which banking support and a national response is required to ensure the swift recovery of the industry. National and regional forage shortages or excesses must enable standard operating procedures for the market to adjust accordingly.

Adjusting animal numbers at the end of the growing season or within a growing season is required in order to avoid overgrazing. This can be easily done in May every year, because the amount of grass and palatable bush and the livestock numbers on a farm or in a given grazing area are known, as is the month when effective rain can be expected. From these figures, farmers can calculate whether they have a forage excess or deficit. Farmers can therefore reduce their risk and sell early when a forage deficit is identified. Data obtained from satellite imagery on an annual basis, which is verified through using on-farm forage measurements, is used to adjust animal numbers upward or downward, as needed. If too few animals are allowed to graze in an uncontrolled manner in a grazing area, over-rest and overgrazing can occur in the same camp, at the same time. In Figure 7, the perennial grass plant in the background has not been grazed for several seasons, and will no longer be easily grazed due to its reduced quality; the grass in the foreground has been grazed and regrowth will most likely be re-grazed, which will possibly result in the plant weakening and dying over time. Both the overgrazed and over-rested plants experience a reduction in productivity and vigour. This occurs on many farms in Namibia.

If animal numbers, the amount of available forage, how much an animal eats each day, and when the rains are most likely to come in the next season have been determined, and whether a drought reserve and food for the microbes has been accounted for, then it is a simple calculation to determine whether the farm, region or country has a forage excess or deficit and which correct management action needs to be taken quickly at the correct scale.

Stocking rate calculators that can assist managers with these calculations are available (see http://www.namibiarangelands.com/2019/05/rangeland-fodder-flow-planner-app-android-and-ios/ for an example of a mobile phone application on Forage Flow Planning, which is available on Play-Store...
Achieving an increase in sustainable stocking rate on a farm over time must be accompanied by adjustments down in years of low forage production; therefore, farmers can ensure that improvements to the system are sustained. Equally important, animal numbers can be adjusted up in years of forage excess in order to ensure that plants are well utilised and good profits can be achieved, while ensuring an adequate drought reserve and increased soil cover. This calculation can be done at any time of the year should the farmer feel that livestock adjustments are needed; however, this should always be done in May of each year.

The stocking rate can be driven up by applying a healthy grazing plan, but adjustments must be made when forage shortages occur due to erratic or poor rainfall. This will ensure that restocking returns to previous levels and that resilience in dry years is increased over time. Figure 8 illustrates how sustainable stocking rates have declined over the past 50 to 100 years as a result of poor management. By applying healthy rangeland management in combination with strategic bush thinning and landscape rehydration techniques, it is expected that the sustainable stocking rates of 50 years ago will again be achieved, or even exceeded.

It is important to address the root cause of the loss of productivity of Namibian rangelands. The application of healthy grazing principles will result in the return of perennial grasses, which will improve soil moisture. The application of landscape rehydration techniques will further increase soil moisture and promote herbaceous growth, which should result in a shift in microbes from a
fungal-dominated state to a more balanced bacterial-fungal mix. Furthermore, this change will hopefully result in healthier soils and healthier forage plants that will reduce the resurgence of woody species.

1.6. Key drivers of livestock production and profitability

Given that the price obtained per kilogram for meat products is fairly consistent, there are two key drivers that livestock farmers need to take seriously. The first is to **reduce the cost of production (COP) per animal**. This involves cutting costs wherever possible, but it also involves syncing the farm’s natural production conditions to the animals’ nutritional needs through the seasons and other environmental and market forces. This means that when the animals’ nutritional needs are highest (i.e., three months before calving and three months after calving, or several months before sales), they must be met as far as possible by the natural growth of the veld. The second is to **increase the farm’s productivity per hectare** in the cheapest way possible. The application of these two factors will set the more profitable farmers apart from the less successful farmers.

These two changes are within every farmer’s control. All farmers have the ability to make these changes, which, really, are the keys to success. In order to achieve this, the livestock producer must manage livestock in such a way that it grows more grass over time and, at the same time, ensures good animal fertility and performance, all while working with the environment and not against it.

1.6.1. Understanding the key drivers of extensive livestock profitability

In order to stay profitable in the livestock business, the animals’ body condition is always vital. All management decisions affect body condition and vice-versa. If body condition is good, then daily gains will be good, fertility will improve, and animal numbers will grow. If the soils are improved through sound rangeland practices, they will produce more forage, and consequently, increased animal numbers can be sustained. All of these can be achieved as long as best management practices are followed. This strategy document sets out to provide some guidance on how this can be achieved.

The ideal to aim for is a low-input animal that gains weight fast and is fertile under extensive management conditions, as well as for a sustainable stocking rate that climbs over time. If this is combined with controlling input costs of the livestock business, then profits will rise steeply.


**It is essential to first understand the relative importance of a sustainable stocking rate, fertility, animal performance, and frame size.**

Livestock profitability is determined by the following four key factors:

1. Sustainable stocking rate is 8 times more important than the animal frame size chosen.
2. Animal fertility is 4 times more important than the animal frame size chosen.
3. Growth rate/animal performance is twice as important as the animal frame size chosen.
4. Animal frame size and efficiency of the animal you farm with determines the profitability of the business (i.e. the animal you select to farm with is a key decision that will determine your animal input costs; functionally efficient and well-adapted animals can produce more kilograms per ha and more profit per ha).

“Stocking rate is 8 times more important than animal fertility, which is four times more important than animal growth rate, which is twice as important as carcass size.”  — Dr Michael Bradfield

Increasing stocking rate sustainably over time is the single most important factor to drive livestock profitability upwards. The relative contributions to livestock profitability assist farmers with deciding where to invest their time, money and labour. As Namibia’s rangelands are in decline, the sustainable stocking rate throughout Namibia is also in decline. The weak link in the chain of production that the farmer must address is to increase the sustainable stocking rate, while ensuring good animal performance and fertility. Farmers need to reassess their investments to make sure that their land management contributes to improved sustained numbers of livestock. If they do not, they will struggle to remain competitive.

A sustainable stocking rate is the most critical factor that determines profits; therefore, healthy soil and natural grass and/or bush are the greatest assets for a farmer. But this asset is often the least understood, cared for, managed and supported. Fixing this requires that farmers and policy makers undertake a major
mind change. Current rangeland management practices are killing good perennial grasses and causing bush encroachment. If an increased stocking rate is the most important driver of profit, then more grass and/or profitable bush needs to be grown as cheaply as possible.

In order to achieve this, each farmer must:
1. change their rangeland management in order to grow more grass to convert more sunlight into meat over time;
2. improve the mineral and water cycle over time, in such a way that more palatable grass is grown per unit area and biodiversity increases;
3. develop a grazing plan (which includes recovery periods, animal impact, etc.); and
4. optimise livestock fertility and production.

1.6.2. Aligning your production system with natural conditions

When deciding on your production system, it must be done with an understanding of seasonal fluctuations. The key is to carry optimum numbers of livestock during high forage quality and quantity times, without incurring high costs during forage bottlenecks. This is achieved by aligning your production system as far as possible with the natural fluctuations in forage quality and quantity. Decisions relating to the type of production system (i.e. cow-calf, weaner or ox production with or without small stock and game) are major decisions, and changes should not be made merely to chase a market. These changes cost money and losses in production are often incurred. Make changes slowly and carefully.

Stocking rate, calving time, and animal preparation for market must be considered in the context of the operating environment. It is advisable to align the forage production curve (i.e. the energy and protein curve) and key nutritional times of the animal (i.e. the last few months of pregnancy and calving time) as much as is possible. The key is to minimise supplementary feeding and to avoid loss of performance. In other words, try to have only dry cows when there is a high likelihood of forage shortage; use green growth effectively for growing animals; and grow resilience and the overall production to reduce input costs during months with high animal nutritional demand. Flexibility can be achieved by buying speculation stock when needed.

For all farmers, there are a number of key questions that require additional decisions to be made:

- Is it more beneficial to fatten a weaner or to maintain a cow?
- Should you sell calves as weaners when quality and quantity of grass is available?
- Should you keep steers after maturity, as they eat grass for little gain and have reduced commercial value?
- At what age should animals be sold off?
- Do you supplement or sell late calves/heifers?
- Can you finish your livestock on naturally good pastures when nutritional need is high?

All of these key questions need to be carefully considered by all farmers.

1.6.3. Ensuring animal fertility: conception, calving and weaning rates

The first steps towards increasing fertility and production includes growing more high quality grass at a low cost and syncing the livestock enterprise with natural events. Animals that are born in an area are best adapted for reproducing in the same environment. An efficient herd is one that performs well according to the farm’s conditions.

In order to ensure an efficient herd, the following factors need to be considered:

1. An adequate bull to cow ratio.
2. The implementation of a culling policy, focusing on keeping the animals that can raise an unassisted calf every year.
3. The reduction of stock losses through pro-active vaccination, pro-active nutrition, and actions that reduce stock losses to theft and predation.

1.6.4. Choice of animal and ensuring optimal growth rate and fertility: ability to raise calves

The animal(s) that a farmer chooses for a particular farm depends on many factors; however, the key factor that must drive this decision is the input cost per animal in order to achieve predetermined production goals. The choice of animal has a major impact on the profitability per ha. The animals selected should be well adapted, functionally efficient, and early maturing. For example, from the age of 30 months old, a beef cow should produce a calf every year off the veld with minimal inputs, and the calf should have a weaning weight of 40-50% of the mother’s weight at 7 months old.

It is extremely important to ensure that animal performance (i.e. live weight gain and milk production) is taking place on a daily basis. The nutritional quantity and quality of forage, the availability of macro and micro elements, and good water quality are critical for good animal performance. Managing the rumen in livestock is important because it ensures the effective conversion of forage into meat. The rumen is made up of several types of bacteria; therefore, it is important to ensure that forage intake favours the good bacteria and that dietary changes are brought about slowly. The rumen pH should be kept neutral, as this ensures maximum nutrient uptake. The animals should be visually inspected every day to ensure that they are all full when ruminating. To ascertain this, look at the triangle on the top left-hand side between the rump and spine; it should not be hollow. If there is no hollow, it indicates that forage intake is not being restricted. In addition, dung that is neither too sloppy nor too hard indicates that the rumen is functioning effectively. Animal performance cannot be attained if intake is being restricted, and the reasons for restriction must be investigated.

Ruminants utilise microbes to convert grasses high in lignin into energy; this relates to animal performance which, in turn, relates to money.

Figure 10 illustrates how ingested true protein from plants and non-plant protein (NPN) from licks and other sources is converted by bacteria in the rumen into amino acids, methane...
and energy. The effectiveness of this process determines animal performance. Good animal performance results in good body condition, which is a major determining factor for animal fertility.

The aim, therefore, is to have a functionally efficient animal that costs little to keep in good condition and has a high fertility under your management conditions. The development of a grazing plan for a farm must ensure that animal performance and fertility is good; however, at the same time the grazing plan must ensure that more grass is grown each year, that plant diversity increases, and that favourable grasses replace the unfavourable ones. When these factors are in sync, livestock profits will rise.

Currently, market prices penalise small frame sizes, which is potentially detrimental to farm profits. Hopefully, this situation will change over time; for now, market price is a factor to consider when choosing frame size.

1.6.5. Other key management factors
Running a livestock farm is not only about growing more grass and increasing animal performance and fertility with a functionally efficient animal. It is important to cut unnecessary costs and invest in wealth-generating costs. However, there are a number of other factors that also contribute towards making a farmer successful.

Some of these factors include the following:

1. Successful farmers have a clear vision of why they are doing what they are doing, what they want to achieve, and what the farm should be like in order to achieve this. They have a shared vision of the farm (with partners, staff and family), and this vision is operationalised into annual plans. All key decisions that are taken every day are steps towards achieving this vision. This process requires discipline and commitment, which is vital for achieving an outcome that is socially, environmentally and economically sustainable.

2. Successful farmers plan their farm’s infrastructure, as this can be a costly undertaking. It is critical to prioritise the infrastructure that is required in order to apply the rangeland management practices that enable sustainable stocking rates to climb over time. These costs are vital as they will generate wealth over time. To ensure that these and other investments are successful, make sure that the investments are worthwhile by doing a marginal reaction calculation on all investment scenarios, and select the one that gives the greatest benefit. Different rangeland management options will have different infrastructure requirements; therefore, selecting the regenerative rangeland approach suitable for your conditions is also vital.

3. It is important to monitor key aspects of your farming operation. It is very important to take stock of your vision, finances and infrastructure plan on a regular basis. It is also extremely important to carry out animal performance on a very regular basis, as this is where the money from the enterprise is generated. Making sure that forage intake is optimal and that the animals’ rumens are healthy is an important part of animal performance. It is important to know whether the rangeland is becoming more productive over time as this is the biggest contributor to livestock production profits. Estimating forage production in May every year is critical and there are easy methods that allow this to be done. Satellite imagery under this and other projects have refined the collection of satellite data that can be used to compare on-farm calculations. Based on the annual forage calculations, animal numbers will be seasonally adjusted upwards or downwards (See NNFU 2018, “Different methods and tools to determine forage availability”, page 105 in the manual and slide 220 in PowerPoint). This, together with taking annual pictures in October to see whether you are achieving all year round ground cover and whether perennials are replacing annuals, will tell you whether your management is operating effectively.

The most important indicator of livestock production success is the production and profit per ha of the farm:

**Production per ha (live weight):**
= Total kg live weight produced in a year/ha

**Income per ha:**
= Production per ha (live weight) x price/kg received (live weight)

**Profit per ha:**
= Income per ha – Expenses per ha

This is the main measure of success of the farming enterprise, which needs to be monitored and then management corrected when necessary.

4. It is important to focus on meat quality (marbling) and proper ageing of the meat in order to ensure that niche markets can be realised. In addition, labour efficiency, conditions and the motivation of employees is vital. Management efficiency is a key to success and farmers need to become more and more efficient over time.
2. BEST PRACTICE

There are numerous examples of best practices in Namibia and beyond. Regarding improved rangeland management, for example, there are a number of interventions that have proved that stocking rates can be sustainably improved by adopting management approaches that support diversity, and increased soil carbon and biodiversity. This section presents case studies of tried and tested practices of both emerging and established farmers from communal and title deed farms. These practices include the Split Ranch Approach, several Holistic Management approaches and the Mara Fodder Bank Approach. Other best practices include bush thinning, landscape rehydration and fodder production. This strategy document also supports the trialling of new innovations such as hydroponics.

2.1. A closer look at best practice

Once farmers have a good understanding of the drivers of livestock profitability, they will need to decide which best practices must be applied on their farms. These best practices, which include the importance of soil carbon (Section 1.4); an understanding of non-negotiable forage plant needs (Section 1.5); and the key drivers of sound management practices (Section 1.6), are the most critical factors for success. The best practices presented in this section are intended to give an idea of what methods exist and how they have been applied. Farmers need to consider how best these practices can be applied on their farms, and to learn from the presented best practice approaches in order to formulate a plan for their particular farming conditions. Once a selected approach has been chosen, the farmer needs to ensure that the principles are being applied and to monitor progress over time.

The selected rangeland management approach must then be combined with bush thinning or landscape rehydration, as is necessary. Re-seeding of the veld can be done with a high species diversity to increase biodiversity and productivity. The case studies included in this strategy document have been selected by the three unions, which were also presented at the Rangeland Forum in 2018. These approaches are being supported by the MAWF and the Namibian Farmers Unions. It is intended that these approaches and the Mara Fodder Bank Approach. Other best practices include bush thinning, landscape rehydration and fodder production. This strategy document also supports the trialling of new innovations such as hydroponics.

Additionally, every farmer must focus on managing animal performance, achieving improved rates of conception, rigorous selection within the herd, appropriate nutrition, safekeeping of the livestock, and increasing sales. This approach ensures that farmers remain profitable over the short term, and that production per hectare and profit per hectare increases over time.

In order to increase sustainable stocking rates, the adopted approach must result in improved soil carbon, water-holding capacity, biodiversity, and microbial activity, which, collectively, results in improved primary productivity. Based on the non-negotiable forage plant needs, tried and tested approaches in Namibia, within the region as well as internationally, have been selected because of:

a. improvements in the mineral and water cycle, resulting in improved soil carbon, soil structure and plant biodiversity;
b. improved forage production and increased sustainable stocking rates over time, resulting in improved production and profit per ha.

Once a rangeland management approach has been adopted, it can, depending on the circumstances, be combined with one or both of the following accredited approaches:

c. Bush thinning to reduce excessive competition between grass and woody species.
d. Landscape rehydration techniques to bring water back to the land.

Farmers can also combine these approaches with drought/risk mitigating approaches, which includes planting cultivated pastures and/or drought resistant forage bushes.

At present, communal areas (which constitute 37 million ha) are unable to enforce grazing plans. This situation is considered a high priority, as grazing plans would enable the application of healthy grazing practices in these areas. Communal areas will continue to degrade if this situation is not addressed. Additionally, the
Northern Communal Areas are confronted with having to mitigate the current tensions between croplands, livestock production, wildlife, and tourism.

With regard to title deed farms and communal areas, inadequately controlled wildlife numbers remains an issue which needs to be resolved before effective grazing plans can be applied.

Game farms, too, are under increased scrutiny with regard to the ecological implications of not applying the principles of non-negotiable forage plant needs. Even though the same principles of non-negotiable forage plant needs apply to game farms, an appropriate case study has unfortunately not yet been included.

The greatest incentive for farmers to change is their realisation that farm profitability can and will increase over time, making the change both possible and financially feasible. What is required is for farmers to recognise their current situation and the need for available assistance in order to get around the problem they find themselves in. The more effective this support is, the faster the recovery of the livestock sector and the Namibian economy will be.

As mentioned, the overriding success factor is the creation of an enabling environment that can support the application of a grazing plan. Once an enabling environment is in place and the farmer has selected a regenerative grazing plan, it is vital that the farmer pays persistent attention to what is happening with the rangeland and the livestock, on a very regular basis. As Namibia’s dry and variable climates can render systems ineffectual, farmers will need to repeatedly plan and re-plan, where grazing plan movements will need to be either shortened or extended based on what the farmer sees on the ground. Although there is a move towards the use of technology, this can only add value if it is based on a sound understanding of the farm and what is needed in order to achieve success.

Table 1 provides an overview of each of the rangeland management grazing approaches, including their pros and cons. The approaches highlighted in red are not regenerative, and those highlighted in green are regenerative. It is important to note the inclusion of management intensity and infrastructure required, as this is designed to help farmers choose a method appropriate for their purposes. For example, a weekend farmer would be ill advised to select a grazing management approach that requires high management input if an extremely capable manager is not appointed to run the farm.

All regenerative rangeland management approaches include the principle of recovery of grass plants after being utilised by livestock. One approach that utilises grass plants heavily in the growing season may recommend a full growing season’s recovery, while another approach that only utilises ‘one bite’ may only need 40 days of recovery.

A key aspect of the National Rangeland Management Policy is that it does not refer to or support the application of fixed carrying capacities in Namibia’s livestock sector, as this concept is not appropriate to Namibia’s dry and variable climate. Due to our highly variable rainfall, the NRMP promotes the timely and flexible adjustment of animal numbers to available forage in order to enhance the flow and conversion of sunlight into digestible and high quality forage. The NRMP aims to sustainably improve animal production per ha, decrease farmer vulnerability and improve biodiversity by focusing on improving water and mineral cycles. Improved water and mineral cycles are achieved through promoting methods that increase organic matter on (soil cover) and in the soil, reduce competition of unwanted bush, and restore base levels at key points in the landscape. The NRMP promotes the application of well-planned and proper rangeland management throughout the country, including the careful planning and development of new water infrastructure. Furthermore, the NRMP indicates that timely provision for disaster situations pertaining to drought is required.

Different Rangeland Approaches Presented
Several rangeland experts presented their approaches at the National Rangeland Forum in 2018.

1. Riaan Dames addressed the audience on the Split Ranch Approach, which entails maintaining current levels of livestock by utilising approximately half of the land in a given year and resting the other half in the same year. In the following season, these areas are alternated. This should not be a fixed principle, as it depends on individual circumstances and the condition of the rangeland that you start off with. This approach allows animals the opportunity to select plants in the growing and non-growing seasons.

2. Ian Mitchell-Innes has been implementing holistic planned grazing on his ranch in South Africa for the past 20 years. This focuses on the importance of feeding the whole system (grass, animals, soil surface and sub-soil), using animals at high and ultra-high stocking densities (mob grazing). His approach is to combine herds and move them quickly through the camps, allowing only the ‘first bite’ of favourable grass species. The utilisation levels are low and recovery periods can be relatively short (40 days). These short recovery periods keep the plants in a high-quality vegetative stage.

3. Wiebke Volkmann presented holistic planned grazing, using longer recovery periods of up to 140 days. This approach reduces selective grazing of unpalatable grasses, and allows grasses a long recovery period after grazing.

4. Hendrik Botha, a farmer from Okahandja, explained that he has achieved success with an eight-camp approach combined with bush thinning. He manages this approach by allowing animals to graze for one month in a camp and alternating it with a rest period of three months before it is utilised again.

5. Jerome Boys from the MAWF explained the successes achieved while using the Mara Fodder Bank Grazing Management Approach. This approach allows longer recovery periods and higher drought reserves than other approaches.

6. Johann Zietsman, a grazing consultant, showed how ultra-high density grazing and careful selection of animals can make cattle farming profitable.

All of the proposed grazing management approaches have shown the potential to increase sustainable stocking rates over time. The importance of the 8-4-2-1 strategy for rangeland management – which has been adopted by the Rangeland Advisory Committee – was stressed. The 8 stands for sustainable stocking...
Grazing approach | Derivatives | Underlying principles | Management intensity and infrastructure required | Potential as veld restoration tool, and impact on nutrient and water cycles | The pros and cons | Local examples
--- | --- | --- | --- | --- | --- | ---
Communal – current widespread management | Open access – with little management applied. No enabling environment to enforce a grazing plan. Continuous grazing (no rest) or partial rest, both with overgrazing and low overall animal impact, but high impact near water and on paths, leading to erosion. Over-rest, far from water. | **Rest/recovery:** Not planned. **Drought reserve:** Not planned. **Fire:** Not planned. **Animal impact:** High on paths, forming gullies. Low overall animal impact. **Compatibility with game:** Compatible. **Impact of drought:** High. | Management demand is low. Water infrastructure is the biggest challenge. | It has no potential for restoring the veld and leads to degradation over time. It has a negative impact on nutrient and water cycles. | Advantages: Low inputs. | Most communal areas in Namibia
Title deed – current widespread management | Multi-camp approach (often with multiple herds). Continuous grazing (no rest) or partial rest, both with selective overgrazing close to water, and over-rest far from water points. | **Rest/recovery:** Not planned. **Drought reserve:** Not planned. **Fire:** Not planned. **Animal impact:** Minimal. **Compatibility with game:** High. **Impact of drought:** High. | Management demand is low to moderate. Infrastructure is required. | It has a low potential for restoring the veld. It has a negative impact on nutrient and water cycles. | Advantages: Routines are established. | Many title deed farms in Namibia
Fixed Rotation-al Grazing | Conventional system. Recovery period is fixed, irrespective of growing conditions. | **Rest/recovery:** Not flexible. **Drought reserve:** Not planned. **Fire:** May be included or not. **Animal impact:** Minimal. **Compatibility with game:** Moderately compatible. **Impact of drought:** High. | Management demand is moderate. Infrastructure is required. | It has a low potential for restoring the veld. It has a negative impact on nutrient and water cycles. | Advantages: Routines are established. | Many title deed farms and game farms in Namibia
Multi-camp (8 or more) with bush thinning, using adaptive management. | Bush thinning combined with planned grazing, with flexible moves based on key forage indicator species. Bush thinning – follow up and new areas done each year. Focus is on animal performance and utilisation of key species, as well as drought reserve and speculation animals. | **Rest/recovery:** Planned. **Drought reserve:** Planned. **Fire:** Not promoted. **Animal impact:** Minimal to moderate. **Compatibility with game:** Can be planned for. **Impact of drought:** Low. | High level of management is required. Infrastructure is required. Annual selective bush thinning cost. | It has a high potential for restoring the veld. It has a positive impact on nutrient and water cycles. | Advantages: Improved perennial grass cover, good animal production and performance figures. | Case Study: Farm Agagia (Hendrik Botha)

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rate, which is 8 times more important than any other factor in contributing to livestock profitability. Fertility (calving and weaning percentages) is 4 times more important than other factors in contributing to livestock profitability. Animal performance per day (weight) is twice as important as any other factor, and the choice of animal is a factor of 1. This means that the model is true for any choice of animal, but farmers should select animals that are well adapted to their land and have low input costs.
<table>
<thead>
<tr>
<th>Grazing Approach</th>
<th>Derivatives</th>
<th>Underlying principles</th>
<th>Management intensity and infrastructure required</th>
<th>Potential as veld restoration tool, and impact on nutrient and water cycles</th>
<th>The pros and cons</th>
<th>Local examples</th>
</tr>
</thead>
</table>
| **Holistically Planned Grazing**  
(Grazing with adequate recovery. Animal impact can maintain soil cover and keep forage plants healthy and more productive.) | Multi-camp with few herds (high utilisation). | Rest/recovery: Excellent – high grazing intensities with long recovery periods.  
Drought reserve: Possible – in separate camps or over all camps.  
Fire: Excluded.  
Animal impact: High.  
Compatibility with game: Game can be planned for.  
Impact of drought: Low if numbers are adjusted as recommended. | High level of management is required.  
Infrastructural requirement is very high, but it pays. Large number of camps and a high water delivery system needs to be in place. | Proven tool internally.  
Fast and even nutrient recycling via grazing animals.  
Water cycle is maintained through high plant cover. | Advantages:  
1. Even utilisation and distribution of nutrients.  
2. Increase in sustainable stocking rate.  
3. Reduced theft.  
4. Easy to assess forage available and adjust stocking rates. | Case Study:  
Farm Springbok- 
bovley, (Judith Knye)  
Barnes’ farm, Ghanzi, Bo-
tswana |
| **Ultra-high-density grazing.** | Multi-camp with few herds with relatively high animal impact, high selection, and good animal performance. | Rest/recovery: Low grazing intensities with short recovery periods.  
Drought reserve: Possible – in separate camps or over all camps.  
Fire: Excluded.  
Animal impact: High.  
Compatibility with game: Wildlife numbers can be built into the plan.  
Impact of drought: Low if numbers are adjusted as recommended. | High level of management is required.  
Infrastructural requirement is high. Large number of camps needed. | Proven tool internally.  
Fast and even nutrient recycling via grazing animals.  
Water cycle is improved through high plant cover. | Advantages:  
1. Even utilisation and distribution of nutrients.  
2. Increase in sustainable stocking rate.  
3. Reduced theft.  
4. Start with what you have. | Disadvantages:  
High infrastructure costs and high management demand |
| Planned grazing and herding. | Planned grazing and herding. | Rest/recovery: Depends on herd size, size of land, and the time it takes to return to the same grazing area.  
Drought reserve: Possible – in separate camps or over all camps.  
Fire: Excluded.  
Animal impact: High.  
Compatibility with game: Game numbers can be built into the plan.  
Impact of drought: Low if numbers are adjusted as recommended. | Very high level of management is required.  
High infrastructural costs. | Proven tool internally.  
Fast and even nutrient recycling via grazing animals.  
Water cycle is improved through high plant cover. | Advantages:  
1. Even utilisation and distribution of nutrients.  
2. Increase in sustainable stocking rate.  
3. Reduced theft. | Disadvantages:  
High infrastructure costs.  
2. High management costs.  

Grazing Approach | Derivatives | Underlying principles | Management intensity and infrastructure required | Potential as veld restoration tool, and impact on nutrient and water cycles | The pros and cons | Local examples |
|------------------|-------------|-----------------------|-------------------------------------------------|-------------------------------------------------|-----------------|---------------|
| **Riaan Dames Approach**  
(A full season’s rest every second year is required to enable recovery from high utilisation year. Animal performance is maintained by keeping grass in a vegetative stage and enabling selection.) | Rest/recovery: Excellent – half of the farm receives 12 months of rest over every second year.  
Drought reserve: Available – in separate camps or spread over whole farm.  
Fire: Excluded.  
Animal impact: Moderate.  
Compatibility with game: Suitable.  
Impact of drought: Low if animal numbers are adjusted as recommended. | Management demand is moderate.  
Infrastructure is required. | It has a proven potential for restoring the veld.  
It has a moderate to high impact on the water cycle. | Advantages:  
1. Even utilisation and distribution of nutrients.  
2. Increase in sustainable stocking rate.  
3. Improved veld and increased sustainable stocking rate over time. | Some grazing areas in the Northern Communal Areas (NCAs).  
Outokotorua Case Study. |
| **Mara Approach**  
(Perennial grasses benefit from two consecutive growing season’s rest periods. A third of the farm is only utilised in the growing season every third year. During a rest period of 16 months, the rested grass can produce seed. The seedlings have ample time to establish before being grazed. All camps are grazed during the non-growing season as this is beneficial.) | Rest/recovery: Excellent – two thirds of the farm rests every year for the entire growing season.  
Drought reserve: Available – in separate camps or spread over whole farm.  
Fire: Excluded.  
Animal impact: Moderate to high.  
Compatibility with game: Small and medium: Suitable.  
Impact of drought: Low if adjustments are made in animal numbers as recommended. | Management demand is high.  
Moderate Infrastructure is required. | It has a proven veld  
restoration potential as two thirds of the farm is rested ever year.  
It has a moderate impact on the water cycle. | Advantages:  
1. Low if adjustment rate adjustments are needed.  
2. Lack of biomass available in some instances, if insufficient rain was received during October to December.  
3. Later rainfall risk, as this year’s winter third is next year’s summer third. | Farm Mol-
li, Mr Mario Metzger; (Nu-
embia Range-
land Forum 2018 presen-
tations)  
Sandveld Re-
search Station (MAWF)  
Fern Donker- 
bos, Mr Roelie Ven-
ter |
2.2. Outcomes of the National Rangeland Forum, 2018

First-rate Rangeland Management for Sustainable Production

A most successful 22nd annual National Rangeland Forum was held at the end of November, with information sharing between rangeland experts and interested farmers. This year’s forum was hosted by the Namibia National Farmers Union (NNFU), together with the National Rangeland Management Policy and Strategy Co-ordinating Unit and the Ministry of Agriculture, Water and Forestry at the Out of Africa lodge in Otjiwarongo. Regional livestock production specialists and local presenters delivered informative presentations focusing on animal performance and increased sustainable stocking rates, while various Namibian case studies illustrated successful livestock production best practice. Two manuals were also launched at the forum: the NNFU Rangeland Management Manual and the GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) Animal Feed Manual. Speakers included South African rangeland management specialist Riaan Dames, holistic grazing educator and South African rancher Ian Mitchell-Innes, Okahandja farmer Hendrik Botha, rangeland researcher Johann Zietsman, Steve Carver, founder and chairman of the Win Win Group, and Prof. Sikhalazo Dube of Zimbabwe, Southern Africa regional representative of the International Livestock Research Institute. (AgriForum, 2019 – by Jacqueline Louw)

Namibia’s rangelands continue to be less productive and profitable, and livestock production has become riskier over time. This was the main theme that emerged during the 22nd Namibian Rangeland Forum, which was held in Otjiwarongo at the end of November, 2018. The Forum was organised by the Namibia National Farmers Union (NNFU) and the National Rangeland Management Policy and Strategy Co-ordinating Unit (NRMPM), with the support of the Ministry of Agriculture, Water and Forestry (MAWF). Production costs in the livestock industry are increasing at a faster rate than animal sale prices, which means that farming is becoming less and less profitable over time. Many livestock farmers have to supplement their income through diversification such as trophy hunting, charcoal production, or producing bush feed. Low-value products derived from thinned bush tend to cause overharvesting and insufficient reinvestment in regenerative practices. Higher value products should also be promoted, such as biochar, biostimulants, fungal inoculant humic and fulvic acids and medicinal mushrooms. When livestock prices drop, farmers hold on to their livestock and, as a result, grassland suffers. In the face of current challenges, cattle farmers have to be 4% more efficient and sheep farmers 1% more effective in order to maintain the same level of profitability each year, which puts farmers under enormous pressure.

On a national scale Namibian rangelands are managed incorrectly, resulting in declining livestock numbers. It is predicted that title deed farmers who do not change the way they manage their rangelands will be forced out of business in the next five years. In addition, the available livestock markets are not favourable to farmers at the moment. In terms of the communal setting, it was agreed that a formal mechanism needs to be established to enable effective rangeland management principles to be applied for the entire farming community of Namibia. The livestock sector in Namibia is in serious trouble and this forum, organised by the NNFU with support from the NRMPS Project, was dedicated to mapping a way forward in addressing a profitable livestock sector.

Namibian case studies and presentations from regional experts at the Rangeland Forum in 2018 undoubtedly indicated what needs to be done in order to make the degraded land more productive and profitable again. The answer is to work with and not against nature. To be productive, the needs of grass plants, soil and animals must be met. In order to do this, there needs to be a mind shift away from current practices. As much as grass plants need grazing, they also need time to recover after grazing. Recovery time allows plant reserves to be restored and for the establishment of new seedlings. Applying the principles included in the NRMPS will allow more grass growth by decreasing plant spacing, increasing biodiversity, and improving the quality of grass. It must be kept in mind that if plants are severely grazed in the growing season, they will need a full year to recover. In the case of plants that are less severely grazed in the growing season, the recovery period can be reduced to as little as 40 days. At the Rangeland Forum in 2018, several best practices which use the intensity of grazing and recovery as the basis for the respective approaches were presented. Most approaches indicate that, over time, sustainable stocking rates can rise by as much as twofold. This means that the land can sustainably
carry double the number of animals if resources are treated correctly. This could, over time, unleash major value addition and ‘growth at home’ possibilities.

Moreover, it is evident that an enabling environment must be created in order for farmers to manage their rangelands effectively. Awareness should therefore be raised regarding good and bad practices in rangeland management. A bad practice, for example, is overgrazing, which occurs when grass is not allowed enough time to recover after grazing. Allowing grass enough time to recover after grazing is of utmost importance.

Just like grazing, animal impact is also a tool; its intensity and duration can be controlled to achieve an objective. Its application can improve the water cycle, grass production and biodiversity, and it can break soil capping. As the impact of animals also plays a role in the bush-to-grass ratio, it therefore has major implications for how bush thinning and aftercare can be carried out in the future.

Although drought is a reality, its effects can be controlled by having drought reserves. A practical and well-thought-out drought plan should be able to provide for at least two poor rainfall years. Furthermore, it is a good idea to keep a percentage of speculation animals that can be easily removed in poor production years, and to farm with animals that are well adapted to arid conditions. At the moment, a great deal of money is spent on feeding large-framed animals that are not suitable for poor grazing conditions. During times of drought, marketing solutions are required in order to cope with regional and national forage shortages. Grass production is, however, not enough. Farmers need to select approaches that ensure good animal performance and good animal fertility. Animals that are well adapted to conditions may produce better profits than larger-framed animals, particularly in degraded conditions.

In the end, farmers need to have a passion for what they are doing, and a vision for and commitment to the industry. To be successful, a financial plan needs to be in place, which must be regularly reviewed and controlled. Furthermore, land and infrastructure planning needs to be considered, as this will enable farmers to invest in those aspects that deliver the best return on their investments. Financial sectors need to support farmers through financing the enterprise needs of well-prepared farming plans.

2.2.1 Suggestions for the future

During the National Rangeland Forum in 2018, group work regarding the following issues was conducted: What needs to be done to encourage more farmers to implement the approaches discussed during the forum? How can the adoption of these practices be supported throughout Namibia?

Feedback from farmer representatives of the Namibia National Farmers Union (NNFU), the Namibia Emerging Commercial Farmers Union (NECFU), and the Namibia Agricultural Union (NAU) includes the following:

- Communal farmers stated that their main priority is to create an enabling environment that would allow a grazing plan to be enforced. They suggested that this could be achieved through ownership or leasehold agreements, and that a conducive environment for investment must be created, otherwise investment in communal areas will not take place. Furthermore, they stated that they would like to engage all key stakeholders, including regional councils and traditional authorities, in the management of rangeland. Depending on the particular circumstances, solutions for the rangeland management issues in communal areas may or may not require the erection of fences. A new approach should be responsive to these needs.
- Members of the NECFU stressed that they need to develop success stories of best practices that are sustainably supported both financially and technically. In order to identify needs, capacity building through information sharing, demonstrations and farm assessments could be conducted, and then funding could be sourced to address key issues that would drive profitability. They added that evidence-based success and innovation are required for them to be able to reach their potential, and that partnerships, associations, and unions are good vehicles for achieving success. Farmers mentoring other farmers would also be a key strategy for addressing success issues. Although the NECFU members realise the importance of rangeland management, they pointed out that they require additional information dissemination and support resources in order to achieve success.
- Members of the NAU pointed out that farmers need to be encouraged to change their current practices and to adopt more profitable approaches, and that the livestock sector requires a change of mind-set and that the farmers unions must take responsibility for this. They emphasised that they would like to see farmers in advisory positions, because ‘farmers believe farmers’. Study groups with fellow farmers in the same position would be valuable, and these farmers should be encouraged to meet to discuss their production figures. They pointed out that rangeland management starts with financial management, and that appropriate high-tech management methods will get farmers excited about rangeland management, which would lead to increasing adoption. The NAU members highlighted that although combatting bush encroachment requires huge capital input, farmers should not lose sight of the subsequent huge financial benefits. The introduction of subsidised lending rates would help to convince farmers to conduct bush thinning and sound rangeland management. Another issue raised was that the Namibian Forest Act should not stand in the way of farmers trying to improve their rangeland. Furthermore, the NAU representatives see the existing private-public partnerships in the country as a positive factor. The NAU farmers’ final comment was that even though climate change poses an enormous challenge, the methods described during the Rangeland Forum can go a long way towards mitigating these impacts.

Farmers from all unions (communal, emerging and commercial) stated that improved security of tenure is required for farmers to be able to invest substantially towards the goal of improved...
production and profitability. These findings were taken up by the various farmers union working groups and developed further by this strategy.

In conclusion, the NNFU Executive Director, Mwilima Mushokabanji, remarked that the forum proved that farmers in Namibia are united and that they can work together. “Rangeland binds us together and we need to strive for the success of the sector.”

2.3. Best practice case studies

The selected case studies for this strategy document are included in the following order:

**CASE STUDY 1**: Eight-Camp Flexible Rotation combined with Bush Thinning

**CASE STUDY 2**: Split Ranch Approach (long recovery periods)
  a. Title deed
  b. Communal

**CASE STUDY 3**: Mara Fodder Bank (very long recovery periods)

**CASE STUDY 4**: Holistic Management
  c. Multi-camp with high density (few herds) and high utilisation (long recovery)
  d. Multi-camp with high density (few herds) and low, selective utilisation (short recovery)
  e. Multi-camp with ultra-high density grazing (few herds and long recovery)
  f. Communal and Title deed: Planned grazing and combined herding (flexible but mostly high density, with few herds and variable recovery as grazing intensity can be controlled daily)

**CASE STUDY 5**: Landscape Rehydration

**CASE STUDY 6**: Ensuring regeneration of rangeland where encroacher bush has been thinned

**CASE STUDY 7**: Alternative Feeds for Livestock in Communal Areas

*(Note: All case studies have been included as they were published in the AgriForum.)*

**CASE STUDY 1: Eight-Camp Flexible Rotation combined with Bush Thinning**

Only some parts of Namibia receive sufficient, well-spaced rainfall every year. This means that its rangelands are continuously under pressure, which necessitates farmers to adopt first-rate rangeland management approaches to give grass enough time to rest and recover.

Okahandja farmer Hendrik Botha started addressing bush encroachment and improving his livestock and rangeland management in 1996. He now has 40 camps with nine herds, each using four to six camps on his farm, Agagia, north-east of Okahandja. Between January and April of each year, he tries to allow between 60 and 90 days’ recovery of each camp. He shed more light in his contribution at the annual National Rangeland Forum held at the end of last year. He combines this approach with bush thinning to optimise production. According to Hendrik, there are two key strategies to increase production: bush clearing and a four to six camp rotation that allows for a recovery or rest period of 60 to 90 days. He is of the view that in order to obtain an increased sustainable stocking rate, soil condition needs to be enhanced to increase biodiversity. Initially, bush clearing may be achieved mainly by aerial spraying, followed by arboricide applied to tree stumps. He budgets for bush control annually.

Hendrik says, “To succeed in livestock farming you need a long-term vision for what you want your farm to look like. To
realise the vision you need a long-term plan that is reviewed annually and applied rigorously. This takes diligence and ongoing hard work to be successful.” Already in 1987, his vision was to address bush encroachment on his farm while focusing on good rangeland and livestock management. His grazing management has resulted in a steady increase in perennial grasses with a resultant increase in sustainable stocking rate. When he started farming, the stocking rate on Agagia was 25 kg/ha live weight. In six years he reached 40 kg/ha and over 15 years has managed to increase his sustainable stocking rate to 45 kg/ha. Agagia has lime and sandy soils and Hendrik divided his farm according to these soil types. This approach has ensured that the biodiversity of plants on his land increased over the years.

Hendrik believes that animals that are well adapted to a specific farm’s conditions make it possible to increase stocking rates. He has been crossbreeding Brahman and Simmentaler since 1977. The cost of supplementation has decreased over time as the quality of perennial grasses and legumes started to thrive with good management. He advised that farmers should increase stocking rate based on the amount of grass available, but that they must also focus on animal fertility and animal production. He achieves good animal performance by visiting each post twice a week and moving stock out of a camp when a predetermined level of utilisation has been achieved. According to Hendrik, the higher the stocking rate on the farm, the better the rangeland and overall management must be. “Critical monitoring of animals and rangeland is important year round. If animals graze more than the predetermined height of the grass, they should be moved, likewise when new grass shoots are eaten or if the lick supplement intake becomes too expensive. A good time to assess grass is in May when animal numbers should be adjusted for the non-growing season.” Hendrik’s farm is 70% cow-ox production and 30% weaner speculation. This allows him the flexibility to increase the stocking rate when grass production is good or, like this year, to decide not to buy in weaners at all.

**Principles of Grass Root Development**

1. Recovery of grass can only take place within the rainy season.
2. Root development is negatively correlated to above ground growth.
3. Root development is most active in early spring and late summer.
4. Roots cannot grow in dry ground and the loss of root mass is double that of above ground loss as a result of degradation.
5. The more severe the defoliation, the greater the root die-off and the longer the recovery needed.
6. A full year’s rest increases production in the following year.
7. Hendrik’s sound advice is to “Evaluate grazing regularly, know the rangeland management principles, apply it consistently and focus to implement all aspects in maintaining a balance between rangeland and livestock management.”

<table>
<thead>
<tr>
<th>Central Namibia – 75km NE of Okahandja</th>
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<tbody>
<tr>
<td><strong>Current SR = 40.4 kg/ha</strong></td>
</tr>
<tr>
<td><strong>Started Farming 1972</strong></td>
</tr>
<tr>
<td><strong>Began Dehorning 1996</strong></td>
</tr>
<tr>
<td><strong>2-6 camp (Jan to Apr) 60 to 90 days</strong></td>
</tr>
<tr>
<td><strong>70% Cow – Ox (sel 30 month, 295kg, 80% A8 grade)</strong></td>
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<tr>
<td><strong>30% Speculation – Weaner</strong></td>
</tr>
<tr>
<td><strong>Cross Breeding</strong></td>
</tr>
</tbody>
</table>

**2010/2017 season’s above ground herbaceous biomass**

- **Herbaceous biomass (kg/ha)**
  - 0% - 25 kg/ha
  - 26% - 50 kg/ha
  - 51% - 100 kg/ha
  - 101% - 200 kg/ha
  - 201% - 300 kg/ha
  - 301% - 400 kg/ha
  - 401% - 500 kg/ha

**2017/2018 season’s aboveground herbaceous biomass**

- **Herbaceous biomass (kg/ha)**
  - 0% - 25 kg/ha
  - 26% - 50 kg/ha
  - 51% - 100 kg/ha
  - 101% - 200 kg/ha
  - 201% - 300 kg/ha
  - 301% - 400 kg/ha
  - 401% - 500 kg/ha

<table>
<thead>
<tr>
<th><strong>Rainfall (% Above/below average)</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Stocking rate (kg live weight/ha)</strong></td>
</tr>
<tr>
<td><strong>Production (kg live weight/ha)</strong></td>
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</tbody>
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1500ha aerial in 1996, thereafter 400ha/year chemical by hand.
CASE STUDY 2: Split Ranch Approach (long recovery periods)

TITLE DEED

The interrelationship between vegetation, grazing animals, soil and climate is complex and dynamic. Finding and maintaining a balance between these factors for optimum, sustainable economic production has been an ongoing challenge for livestock farmers in drier climates of the world, including Namibia. Profitable livestock production entails a fine balance between forage production, utilisation efficiency, an understanding of spatial and seasonal variation in natural resources, and animal behaviour. “I do not like to talk about specific systems for rangeland management because one person can implement a certain system successfully, while another can use the same system with disastrous results,” said Riaan Dames, rangeland management specialist and farmer, at the 22nd National Rangeland Forum held in Otjiwarongo at the end of last year.

That said, however, he favours the split ranch grazing approach for rangeland management, which entails the resting of 50% of a farm’s grazing annually, while the other 50% is grazed. In other words, if a specific camp is grazed in one growing season, it will be rested completely in the next growing season. The camps being grazed in a particular growing season are heavily utilised and therefore need a long period of one complete growing season to recover.

Talking about the main principles of the strategy, he emphasised that utilising half the land and resting the other half should not be a fixed rule, as it depends on individual circumstances and the initial condition of the rangeland and what happens in a specific place. “In practice, people are utilising anything between 50% and 60% for resting, depending on the year, sometimes even resting land for two consecutive years. This approach supports animals to select high-quality forage which allows good animal performance, while giving recovery and improving the sustainable stocking rates at low cost.”

Stocking Rates

A farm’s sustainable stocking rate is strongly driven by grass productivity with the implication that sustainable stocking rate is not fixed and can be improved or degraded by increasing or decreasing grass productivity. Riaan says, “If you overstock, you will pay the price. Ultimately, it is about the litres of water used per kg of meat produced.” He pointed out the sobering equation of the approximately 40,000 litres of rain used to produce a kilogram of meat. Riaan estimates that depending on soil condition, 13 to 20 kg of meat are being produced per ha per annum in Namibia with 450 mm of rain annually, compared with 40 to 45 kg per ha in South Africa. This means that Namibia’s production can still be significantly improved. Ultimately, the profitability of a business depends on a low production cost for every kilogram of meat and the amount of kg produced per ha. If this is calculated as the profit per ha per mm of rainfall, then the efficiency achieved that year can be ascertained as well as comparing different areas across the country. In times of drought, where the rainfall deviates more than 25% of the mean annual rainfall, livestock numbers should be adjusted by 10%. Having adequate forage in a drought year is highly profitable. If a farmer can avoid selling when everyone else is selling due to low forage availability, then higher prices are likely to be achieved. Riaan advises that it is good practice to adjust stocking rates every year to the amount of forage available to the animals you have.

Choice of Animals

According to Riaan, soil fertility and the type of nutrition it can yield should determine the type of animals producers stock their farms with. Although a passion for certain cattle breeds is linked to this choice, at the end of the day it is determined by economics. Improved rangelands mean better nutrition and this makes it possible to stock with larger animal breeds. In areas where the frequency of drought is higher and the soils are sandy, smaller animals are more suitable. Other considerations when choosing animals are forage structure and type and survival economics influenced by the cost of controlling predators and market requirements. Free roaming game follows quality rangeland and...
rainfall distribution is another complicating factor in rangeland management. Riaan cautioned that farming only with game without controlled resting periods for rangelands will be detrimental to them, resulting in lower sustained stocking rates.

In conclusion, Riaan stated that the split ranch approach he promotes is applicable in areas receiving from 100 mm to 1200 mm annually, with varied utilisation efficiencies. He further warned against grazing water-stressed plants in the growing season, as irreversible damage can be caused. Grazing plans need to be flexible and animals should be moved to areas where grass is well established. Numerous rain gauges distributed on the farm assist with this decision making. Successful rangeland management needs a fine balance between forage production, utilisation efficiency, and the understanding of spatial and seasonal variation, natural resources and animal behaviour.

COMMUNAL

The split ranch approach is being implemented in the Dzoti Conservancy in the Zambezi region. The Dzoti Conservancy Grazing Plan Rules include the following:
1. All livestock (cattle, goats, sheep, horses and donkeys) should stay in the area north of the tar road from January to June, depending on water availability.
2. All livestock should move to the grazing area south of the tar road in July, and stay there until December.
3. Exclusive wildlife and tourism zones should be avoided by livestock.
4. Livestock from the three villages (Silonga, Malengalenga and Kakiramupepu) will stay independent from each other in the grazing areas.
5. An assessment of forage availability for the dry season ahead is done annually, at the end of the growing season.
6. The conservancy’s livestock committee will discuss options to adjust livestock numbers to available forage sources every year.
7. Suitable punishment will be enforced for non-compliance with the grazing plan rules.
8. The grazing plan is flexible and should be reviewed and adapted periodically.

9. The conservancy plans to install predator proof infrastructure (i.e. lion fences) in grazing areas to reduce human-wildlife conflict.
10. Livestock will be herded and ‘kraaled’ within the grazing area in such a way as to minimise contact/conflict with wildlife, especially predators.
11. The livestock committee, under the auspices of the Dzoti Conservancy Management Committee, will oversee the implementation of the grazing plan.
Results from the Sandveld Research Station and Farm Donkerbos include the following:

Jerome Boys, who is a pasture science specialist in the Directorate of Agricultural Research and Development (DARD) in the Ministry of Agriculture, Water and Forestry, explained the Mara fodder bank grazing management approach at last year’s National Rangeland Forum: “The fodder bank grazing management approach allows for a full growing season’s rest to a certain portion of the veld on a rotational basis. In theory, this should enable the land user to build up a fodder bank to be grazed at a different time of the year.” Jerome presented this approach together with Roelie Venter, who applies this approach on his farm, Donkerbos, in the Omaheke region.

The fodder bank grazing management approach started in 2004 at Sandveld and was later adopted by Roelie. Both the Sandveld Research Station and Farm Donkerbos are situated in a camelthorn savannah area with primarily sandy soils and an average long-term rainfall that varies from 350 to 400 mm per annum. The dominant woody plant species are *Terminalia sericea*, *Senegalia mellifera*, *Vachellia erioloba* and *Dichrostachys cinerea*, of which the densities can vary from 800 to 4 000 plants per ha.

**Implementation**

1. Identify and plot different veld types of equal potential and determine grazing capacity.
2. Divide year into three seasons: Growing season, winter and spring.

**Guidelines for Implementing the Fodder Bank Approach**

1. Know that the different grass species vary in terms of palatability (consider this when determining the grazing capacity for an area).
2. Accept that animal performance is linked to sufficient quantities of palatable grasses.
3. Division of a farm should be planned to make provision for differences in the veld.
4. Maintain correct stocking rates by adapting animal numbers to pre-determined grazing capacities.
5. Keep records of animal numbers and the number of days a camp was rested and grazed.

### CASE STUDY 3: Mara Fodder Bank (very long recovery periods)

**The Mara Fodder Bank Grazing Management Approach**

This table shows how the different thirds of land are grazed systematically during alternative seasons

<table>
<thead>
<tr>
<th>Year</th>
<th>Growing Season</th>
<th>Winter</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>Third A</td>
<td>Third B</td>
<td>Third C</td>
</tr>
<tr>
<td>Year 2</td>
<td>Third B</td>
<td>Third C</td>
<td>Third A</td>
</tr>
<tr>
<td>Year 3</td>
<td>Third C</td>
<td>Third A</td>
<td>Third B</td>
</tr>
</tbody>
</table>

Rainfall tends to be a reasonably strong driver of changes in dry material (DM) production at both farms. It is important to not treat all plants as equally palatable as species composition can be seriously altered. Should unpalatable species increase, the stocking...
density should be increased to utilise the unpalatable species. Some principles applicable to any grazing approach fulfilled by the Mara fodder bank grazing management approach are:
1. Perennial grasses can only rest and recover during the rainy season.
2. Every farm has its own production potential that must be realised.

3. The livestock herd must adapt to the farm’s potential, not the other way around.

There are challenges for the approach, one being the occurrence of late rains, where difficult choices have to be made. The benefits include long rests for the complete recovery of the veld. Forage flow planning is an additional benefit.

**CASE STUDY 4: Holistic Management**

a) Multi-camp with high density, high utilisation and long recovery (few herds), in Namibia.

Judith Knye shared her farming experience of combining large and small livestock on Farm Springbockvley in the Kalahari Sandveld near Leonardville. Wiebke Volkmann presented her presentation.

**Production History**

The stocking rate on Springbockvley is 24 to 45 kg/ha with 1 000 head of cattle and 3 800 sheep. Judith decided to change from Simmentaler to Nguni cattle and from Karakul sheep to Damara sheep because they are better adapted to the area’s climate conditions. Originally there were five big herds, which she has now organised into three herds of oxen, cows and sheep. She supplements the cattle and sheep with a salt-phosphate-sulphur lick. Since 2011 she has no longer been supplementing with urea because she aims to obtain organic certification. Instead,

the animals are given milled camelthorn pods, and in years of very low rainfall additional oil cake for extra energy is given.

**Grazing Plan**

Three herds/flocks follow each other through all camps according to a detailed grazing plan that flows out of a forage assessment at the end of the growing season. (See illustration bottom left.) The grazing plan provides for meeting the needs of animals, people, soil and plants. It also ensures that at no point in time do two herds/flocks drink at the same water system. Each camp is allowed between 90 and 140 days to recover. The advantage is that every camp gets exposed to small and large livestock, which seems to make a difference in terms of utilisation of the available bush and grass.

**Animal Health and Selection**

Judith deals with internal and external parasites by knowing the natural cycle of these parasites and breaking their life cycle.
by applying planned grazing. This greatly reduces veterinary costs. She further adjusts the sizes of the herds according to the availability of water. As mentioned, the breeds are chosen for their adaptability to the conditions of the farm. Initially, Judith was very strict with animal selection criteria and marketed cows that did not conceive immediately after reaching 18 months old.

This was relaxed somewhat as she wanted to increase the size of the herd to eat all the grass. She runs a closed herd with bulls from her own herd supplemented occasionally by fresh blood from purchased bulls. With the sheep, the rams are in the herd the whole year round and no castration takes place because it is simply too much work.

Multi-camp with high density, high utilisation and long recovery (few herds), in Botswana

The Barnes family manage a cattle operation in Botswana, 27 km south-east of Ghanzi. Their holistic management plan was presented by Wiebke Volkmann. The data for this presentation was supplied by Gus Barnes, which focuses on the past five years during which drought affected their farms in the Kalahari Sandveld considerably.

Traditionally a Beefmaster weaner production enterprise, with a stocking rate of 44 kg live weight per ha, they have moved towards buying in young animals prompted by the weak market conditions and the price for weaners. They do not practice bush thinning and manage grazing according to holistic principles, which includes planning for a drought reserve every year. The farm has a diverse tree, bush and grass community with ongoing colonisation of Brachiara negropedata.

Their holistic management and planned grazing also means adjusting the herd size and composition to rangeland conditions. At the beginning of the 2016 growing season, the two large herds on both their farms were combined into one to achieve a longer recovery period of 180 days, and an average graze period of 3 days. This was done to produce more grass and to help reduce losses to predators. Camps (the average size is 294 ha) are subdivided in half with electric fencing.

Animal Health, Performance and Fertility
Before 2016, a self-mixed lick consisting of salt, phosphate, sulphur and urea was administered during the non-growing season. Since 2016, this was changed to a pre-mixed lick with mono ammonium phosphate containing no urea. To assist first-time calving cows to reconceive, the Barnes family implemented a ‘leading herd’ grazing plan in the growing season of 2012. Regular analysis of water, bone and organs, and testing the pH of urine showed a negative impact of over-supplementation, especially when the animals get first selection of the natural forage. To balance nutrition, grazing periods in non-growing periods were lengthened (but to no more than 8 days), and the herd was split differently to provide different supplement composition and intensity to different nutritional requirements of the females in their various physiological stages. In drought times the bulls joined the herd as soon as the rains started, resulting in calving at the end of the non-growing season. At the end of last year, the Barnes family delayed bulling again so that the cows calve later in the summer.

Results in Drought Times
With their grazing plan and its built-in drought reserve, the Barnes family had 27 days of grazing left for the entire herd. Gus Barnes did concede that the herd should have been reduced earlier, but marketing conditions did not allow for this. Looking at rainfall figures for their area, the average rainfall from 2014 to 2018 was 361 mm per year and 291 mm for the three years from 2015 to 2018, while the long-term average is 425 mm. They have survived the drought with as productive a herd as possible, with the least input costs. Production figures for 2018 showed a successful recovery.
things which cannot be changed. According to him, farmers should observe animals: “Even with brown grass, the animal will first take a bite off the top of the grass because they instinctively know where the energy is and will naturally eat the grass with the best available energy first.”

Managing animals in the paddock increases the density over time. If grass is grazed right down to the root, it takes longer to grow back than if grazed lightly: “I believe in grazing grass in a vegetative state. The short recovery periods can keep the grass plant in a highly productive vegetative state, which is good for grass production and animal performance. It is like growing roses which grow back thicker after they have been pruned.”

Ian also indicated that once a grass plant has seeded, the energy from the plant goes into seed formation but is also transferred into the plant below the ground for the next season. During the remainder of the growing season, this plant no longer grows actively and plant quality and animal performance are reduced.

Therefore, one can say that properly-managed animals will grow more grass, and if moved correctly will have good animal performance. Animals also plant grass. Harvesting the energy of the plant is important to achieve animal performance, which is why he promotes light grazing and short recovery periods.

**Soil Health**

With regard to taking care of the soil, Ian said that the soil should ideally be covered at all times to prevent sun, wind and rain from compacting and drying it out. “The land is like a solar panel. Grazing the energy off the solar panel is like wiping it to increase the effectiveness of the panel.” He added that “God knew we were going to mess up, so all the seeds of the plants
Ian Mitchell-Innes pointed out that what used to be here are still here. Grazing should be done in a way to change the environment and soil surface conditions to bring those plants back.” He stressed the importance of keeping farmers on the land because they feed the world. Livestock farmers in dry climates need to change their practices or they will no longer be in business. Ian mentioned an example in Texas where he advised the owners to almost double their stocking rate over time and to combine 3 herds into one. “Putting two herds together doubles the amount of food on a property, because more of the land is not being grazed and is actually recovering. The secret is to manage grass correctly and to allow adequate recovery periods.”

Ian added that “What grows on the soil is a mirror image of what is below the soil surface.” Big, bare areas with unpalatable plants can be turned into lush pasture over time by animal impact and planned grazing. This should not cost anything other than understanding and management. Making investments to enable the grazing plan to be implemented need to be done, but these should be able to be paid off quickly. “Feed the soil, which in turn feeds the grass and ultimately the animal. This is the way to get optimal animal performance and ultimately to make a profit.”

By using livestock, the fungal/bacterial relationship in the soil can be manipulated. Ian is of the view that a 1:1 fungal and bacterial ratio is the optimum for grass. Highly encroached areas are dominated by fungus.

Ian Mitchell-Innes presented the important role livestock play in re-establishing a 1:1 fungal-bacterial balance for late successional grass establishment.

This ratio can be changed through animal impact, dung and urine being more conducive to grass production. Putting litter on the soil covers it, thereby controlling extreme temperatures. Carbon in the soil is critical to hold moisture, which ensures longer growing periods and greater production. He stressed that the type of grass species is not that important, but that the harvesting of energy is crucial. Another important element to keeping the soil covered is to promote Azotobacter – bacteria that live on the soil surface and fix nitrogen into the soil. These bacteria need moisture, a constant temperature and food. If the Azotobacter is fed, it will contribute to grass growth, productivity and animal performance.

The Holistic Approach

Ian’s formula for managing rangeland holistically is to build a ‘stockpile’ through the growing season to gradually graze through the non-growing season: “This is grazed two to three times, depending on what suits us in the non-growing season, to maintain animal performance right through the year. More grass can be grown if grazed in a vegetative state. Everything which is stressed breeds, and the same applies to plants. The more stressed a plant is, the more seeds it produces. This is nature’s way to sustain species for the future. The more you cover the soil and increase the water in the soil, the more fertile it becomes while plants ‘relax’ and produce less seed, grow wider leaves and capture more energy to put more money in the bank.”
When it comes to cattle breeding and rangeland management, Johann Zietsman, veteran cattlemaster and former researcher of the University of Pretoria, believes in leaving convention behind. At the National Rangeland Forum in 2018, Johann explained, “The bottom line is that by using conventional methods unchanged since the 1950s, many cattlemen produce less than 50% of their potential because their cattle are not managed optimally, production costs increase, veld degrades and carrying capacity declines”. Johann is a firm believer that cattle can be used to improve the land: “If managed correctly, there is a symbiotic relationship between cattle and grass. Mimic a natural system where cattle have a beneficial effect on grass; and the more the cattle the greater the positive effect on rangeland. All grasses evolve with severe grazing, but what it cannot handle is ongoing selective grazing and low animal impact.” Johann expects to see a two- to four-fold increase in stocking rate using this method, and he believes that the two key issues holding back success for livestock farmers are fertility and stocking rate. If one can breed early maturing and fertile animals, they should be calving as early as possible.

Mind Shifts
According to Johann, a mind shift away from the goal of maximum production per animal to maximum sustainable profit per hectare is needed. “Many farmers have the goal of maximum production per animal, but that will not be very successful. Stocking rate is the most important determinant of profit; therefore, high stocking rates should be the goal.”

A low stocking rate can produce good looking animals, but it is not good for the veld: “Profit from cattle is about improving the veld through well-managed, high intensity, quick-rotation grazing. It is based on good and sustainable profit per hectare, not on individual animal performance.” Johann believes that time-controlled high animal impact and non-selective grazing are essential for improved rangeland production, diverse species composition, and, ultimately, increased sustainable stocking rates. Another advantage is that harvesting of the resource base is more efficient and bush thickets are opened up.

Double Stocking
The following pictures show the contrast of grass where different stocking rates were implemented. The picture at the top is land that has a conventional stocking rate and the one in the middle has double that.

Johann explained that “Generally speaking, stocking rate can be increased by between two and four times, depending on the environment. Redeemable potential of what you have and what you can have is much higher than two or four times in terms of stocking rate. Management must be achieved by taking control of all animal movements. The biggest challenge is not the physical challenge, but a mind-set change and to be creative.”

Ten months later...
Johann showed the symbiotic relationship between cattle and grass in these photographs, where 3000 cows grazed one hectare of land without adding any fertiliser. The photo at the bottom shows the thriving grass in the same area ten months later. Johann explained that better growth of grazed grass is the result of higher density, as well as enzymes in the saliva of cattle.
that causes it to recover quicker than if you would cut it with a pair of scissors. Grazing non-selectively with a high number and high impact has the result that the better, palatable grasses benefit more from this method than poorer grasses. They also recover better than poorer grasses. Johann says, “The combination of grazing, hoof action, dunging and urinating results in grass quality, and at the same time drastically improved species diversity.” Soil fertility as well as the number of earthworms and dung beetles increases, while the condition and production of cattle also improves, relative to non-selective grazing at low stock density.

**Cattle Condition**

With non-selective grazing, a drop in the body condition of animals must be effectively mitigated because the animals are forced to eat grass they would not normally eat. This creates competition between animals, forcing them to eat more. During this process, the shy feeders will drop out. This must be overcome by farming with animals that have a good inherent body condition score; frequently moving livestock to ensure that they move on to fresh grass; adequate recovery periods to produce improved grass; rumen supplementation; and farming in sync with naturally occurring nutrition. Sound breeding and management practices that select for good body condition score and early maturing animals will result in better production figures. Johann believes that small-framed animals have an unfair advantage over large-framed animals because they are more efficient grass converters, fatter, more fertile, and do not need high levels of nutrition to be productive.

Johann says that “If your goal is maximum production per animal, the biggest obstacle is the scale, tape measure and computer… I am not saying that one cannot measure at all, but inappropriate criteria for current performance testing have to be reviewed and replaced by appropriate selection criteria.” Johann is of the view that selecting animals for absolute growth and feed conversion efficiency will result in a poor inherent body condition. According to Johann, good body condition is the best determinant for cow fertility. Aim for extremely productive cows and extremely efficient harvesting.
Two main options for dealing with improved rangeland management were presented at the National Rangeland Forum in 2018. The first is Planned Grazing and Combined Herding from the Kunene region; the second is based on the Split Ranch Approach where areas are utilised one year and rested the next year. Both require the introduction of an enabling environment to apply these programmes, including the development of an Act.

Amon Kapi is a farmer and chairperson of the Outokotorua Grazing Committee. At the National Rangeland Forum in 2018, Amon Kapi said, “Farmers in the Northern Communal Areas of Namibia know from experience that it is not only the amount and distribution of rain that determines the productivity of the grass and their animals, but also the management of grazing and livestock that makes a difference.”

Amon explained the approach of planned grazing and combined herding of livestock, where wildlife and tourism are also important. He shared what the farmers from the Outokotorua grazing area of the Ehirovipuka Communal Conservancy are doing to develop synergies between key land use options in the area. “The grazing area has boundaries agreed to by the conservancy and the neighbours, and the ‘camps’ have no fences. All livestock within the grazing area are combined into a single herd, herded daily by herders according to a grazing plan based on the principles included in the National Rangeland Management Policy and Strategy Co-ordinating Unit (NRMPSCU). Currently, the herd being managed has about 500 productive cattle and is herded by four workers. The grazing plan is flexible to accommodate recovery of grass plants, animal performance needs, as well as the impact of animals on the grass.”

The principles of planned grazing and combined herding that the conservancy farmers practice include the following:
1. Having a growing season and non-growing season grazing plan.
2. Taking livestock to each part of the grazing area only twice per year: once in the growing season and once in the non-growing season.
3. Allowing for selection and recovery in the growing season.
4. Bringing in as many animals as the land can support in the dry season until the next rains are expected in February.
5. Grazing firebreaks first around the grazing area to prevent fire, and leaving the best grass close to the kraal for the calving season.

Amon also addressed the way in which the community manages the herds by joint budgeting and payment of herders. The stockmen on foot control the animals from sunrise to sunset, using...
Unfenced grazing areas could be the building blocks of the Ehirovipuka Conservancy.

Their close proximity to the animals does not stress the animals. Although herders are isolated, they are equipped with spotlights, torches, crackers and radio communication. Most of the cattle owners live close to Opuwo or adjacent villages and are able to give good support to the herders. This approach of herding during the day and kraaling at night ensures that there are only a few losses due to predators.

**Increased Stocking Rate and Animal Performance**

Having only one herd makes management relatively simple within the conservancy. Bulls run with the cows all year, resulting in high conception rates when the forage is good. Herding the animals reduces the distance they move every day, which conserves their energy. Every evening, the animals return to lion-proof kraals for the night, where water is provided to ensure that they get adequate water in the mornings and evenings, as well as targeted supplements in the evenings. This approach ensures fresh grass for the animals every day, with the added benefit that the grazing promotes grass growth, ensuring higher grass quality in the following year. In addition, no livestock losses to predators have been experienced over the past two years, whereas livestock owners in neighbouring grazing areas experienced up to N$80 000 in livestock losses per month due to lions and hyenas. The watering system enables elephants to drink freely without disturbing the livestock.

Amon stressed the importance of monitoring animals on a daily basis to see whether they have adequate food, are healthy and free of ticks, or are pregnant. Herd numbers are also checked twice daily for theft and losses. Last year’s drought caused forage shortages, which was worsened by game migrating to the conservancy’s grazing area. Other challenges are ‘grass poaching’ from neighbouring farms; getting and keeping well-trained stockmen; and managing stockmen from a distance. Working as a group and reaching consensus on management affairs is not always an easy task.

Amon and the grazing area committee are currently pursuing linkages with conservancies as well as tour operators to develop mutually beneficial arrangements for sustainability.

**Advantages of Planned Grazing and Combined Herding**

The most important benefit of the conservancy’s approach is the good grass production, which ensures excellent animal performance and calving percentages. Due to correct kraaling, infrastructure and good herders, communal farmers are living in harmony with predators and elephants. An added benefit of farming without fences is that it keeps costs down and increases the value of wildlife tourism. Creating large-scale employment for semi-skilled workers could be another spin-off of the approach.
A healthy land supports a healthy community and a prosperous economy, but a chain is only as strong as its weakest link, and if soil cannot properly capture rain it can cause serious breakage.

In the Kunene region, in particular, many rangelands are increasingly not able to hold rain water, intensifying droughts and retarding recovery. Sealed, bare soil surfaces are spreading and joining up, while dongas are forming and expanding with every major rain event. Water is flowing faster in landscapes that are vulnerable to gullying, and wider plane areas (sheet flows) are vulnerable to fragmentation. “Raindrops are hurting the land, not refreshing it, and self-healing is rare. With increasing torrents of precious raindrops, topsoil is lost and with it goes water and food security as well as economic prospects and social and cultural cohesion,” says Hugh Pringle from Ecosystem Management Understanding (EMU™) at the Namibia University of Science and Technology. (See Photo 1.)

Through the use of available resources, these problems are already being addressed, with good success, by keeping rain water where it falls. “Through the Southern African Science Service Centre for Climate Change and Adaptive Land Use (SASSCAL), the Task 41 landscape literacy initiative, funded by Germany, has been working as a team to build awareness of declining soil moisture balances and rain use efficiency, and building grassroots approaches in a cultural context to rehydrate the Kunene rangelands. This region is clearly the most severely affected by landscape incision and excessive run-off in the country. However, the problem extends from the Orange River to the Kunene and Okavango Rivers. It is a nationally threatening process to the goals and targets of the Namibian government,” Hugh explained.

To slow down the speed of water flow, tree branch filters were used from bush encroacher tree species such as Acacia mellifera and Terminalia prunioides. This resulted in deposition of sediments such as sand and the trapping of leaf litter. Water can thus infiltrate and recharge underground water that assists in rebuilding the soil in dongas. (See Photo 2.)

Cattle can be used to trample gully heads. (See Photo 3.)

Implementation to deter soil degradation started in October 2013 in the Erora area as a trial, and was expanded to Otjitunganane in November 2014, and later to Otjiwarua. Work is done with the participation of the communities so that they can take ownership of land restoration. “We have infused scientific principles with the knowledge of local land culture to build an understanding and capacity by utilising EMU™ and CAN principles. In this ethical engagement, we have promoted successful local innovation and ownership and restored groundwater aquifers that are critical to communities and livestock, as well as sheet flooding processes previously captured by the old main road from Windhoek. Dongas are becoming depositional rather than erosional, and perennial grasses are establishing to provide enduring and self-healing landscapes,” said Hugh.

This initiative works hand-in-hand with rangeland management practices such as strategically planned grazing, resting of areas, and creating awareness in communities to avoid the
often leads to more loss of rainwater to runoff from loamy soils and wind erosion of sandy soils.

Bushes act as fertility pumps, extracting soil minerals with their deep roots to grow leaves, wood and more roots, which all feed animals and microbes that cycle minerals through the topsoil. If rangeland resources are harvested for sale off the land, be it milk or beef or hay or wood, then the minerals in those products can no longer cycle there, reducing the soil’s fertility. This is unlike the few elements that cycle between the atmosphere and organisms, both living and dead, micro and macro. These elements include hydrogen, carbon, oxygen, nitrogen and, to a limited extent, sulphur. If removed in plant material harvested in one part of the world, they get redistributed in the atmosphere and can be replaced into organisms and the soil in ecosystems that have other appropriate conditions to support plant growth.

The majority of elements required by plants are minerals that cycle more locally through soil, water and organisms. These include calcium, magnesium, phosphorous, potassium, iron,

CASE STUDY 6: Ensuring regeneration of rangeland where encroacher bush has been thinned

Ibo Zimmermann (NUST), and Johan Bruwer (NamFibre)

Farmers who make decisions to harvest biomass from bush-encroached rangeland bear enormous responsibility for the future condition of the rangeland. If biomass is harvested with disregard for the soil process represented by the bush encroachment phenomenon, then the condition of the rangeland is likely to worsen and support fewer animals. If, on the other hand, the soil process is not interrupted when deciding where and how to harvest and which follow-up treatment to apply, then the rangeland is likely to regenerate and support high production.

Problems from harvesting biomass with disregard to soil chemistry

Instead of blaming bushes for encroaching onto rangeland, it may be useful to view bush encroachment as a symptom of rangeland degradation, not its cause. Nature uses bushes to restore water and mineral cycles that have been disrupted by former land use practices.

The reduction in bush cover that results from de-bushing often leads to more loss of rainwater to runoff from loamy soils and wind erosion of sandy soils.

Bushes act as fertility pumps, extracting soil minerals with their deep roots to grow leaves, wood and more roots, which all feed animals and microbes that cycle minerals through the topsoil.

If rangeland resources are harvested for sale off the land, be it milk or beef or hay or wood, then the minerals in those products can no longer cycle there, reducing the soil’s fertility. This is unlike the few elements that cycle between the atmosphere and organisms, both living and dead, micro and macro. These elements include hydrogen, carbon, oxygen, nitrogen and, to a limited extent, sulphur. If removed in plant material harvested in one part of the world, they get redistributed in the atmosphere and can be replaced into organisms and the soil in ecosystems that have other appropriate conditions to support plant growth.

The majority of elements required by plants are minerals that cycle more locally through soil, water and organisms. These include calcium, magnesium, phosphorous, potassium, iron,
manganese, zinc, copper, boron, cobalt, molybdenum and selenium. If taken off in plants, or in products of animals that consumed some of the plants, then they need to be replaced since their availability in the soil is limited. They effectively get mined if not returned in some form or another.

A study in Namibia’s Thornbush Savanna found a sharp decline in soil fertility as de-bushing intensified. It furthermore found no evidence of restoration of soil fertility, even 13 years after de-bushing (Zimmermann et al. 2017).

Some minerals may be returned through animal licks, but these often contain excess sodium that spreads in dung and urine, further disrupting soil fertility.

Solutions to harvest biomass regeneratively
If bushes are harvested along contour strips (Figure 1), as proposed by Johan Bruwer at the 2014 Namibian Rangeland Forum, then uncleared contour strips infiltrate rainwater, grow fertility and break wind, while cleared strips produce abundant grass if provided with sufficient rest as part of an appropriate grazing strategy. Such contour strips imitate the natural, self-reinforcing pattern of bush and grass strips encountered in some semi-arid landscapes of the world, known by names such as banded vegetation in Australia and tiger bush in West Africa.

Several examples of regenerative rangeland management approaches are included in the previous best practices. One such example of a simple yet effective grazing strategy is the Split Ranch Grazing Strategy, developed by Riaan Dames (Fynn et al. 2017). In its simplest form, it divides the grazing area into two, for year-long grazing to maintain grass in a nutritious state, and year-long resting to rebuild grass vigour for subsequent fast growth (Figure 2). The year-long rest allows grass to both recover nutrients released by microbes during pulses of rain early in the rainy season, and replenish root reserves late in the rainy season.

If the perennial grass seed bank has become depleted due to continuous grazing over past decades, then it may be worthwhile sowing grass seeds within cleared strips (Figure 3) and under bush filters.

If bush filters are constructed from cut branches along a contour (Figure 4), they cool the soil, trap seeds and mulch, and encourage a dense growth of grass underneath, which slows runoff, enhancing infiltration of rainwater into the soil. Old bush filters attract termites that puff up the soil underneath (Figure 5), which ponds rainwater over a wide strip on the upper side and eventually infiltrates to support abundant growth of grass, if appropriate grazing management is applied. The perennial grasses growing under such bush filters take over the filtering function as the bushes decompose. They furthermore enhance self-reinforcement of the filter because more of the water ponded on the upslope side during and after rain tends to escape through portions of the filter line where fewer grasses grow. This results in the soil becoming wetter at such weak locations, enhancing the subsequent establishment of dense grass there, which prevents escape of more water during the next rains, when water will escape through the next weakest locations to repeat the next cycle of this self-reinforcing process.

Various options exist for replenishing minerals, such as spreading suitably processed ash along filters, or providing animals with mineral rich supplements, such as seaweed, so that they spread much of the mineral elements across the rangeland in their dung and urine. Studies by Anthony Mills of the University of Stellenbosch and his team suggest that appropriately balanced fertility may enhance the regrowth of grasses, giving them the competitive edge over regrowth of bushes (Mills et al. 2017).
CASE STUDY 7: Alternative Feeds for Livestock in Communal Areas

ALTERNATIVE FEEDS FOR SMALLHOLDER LIVESTOCK PRODUCERS

Professor Sikhalazo Dube is the Southern Africa regional representative of the International Livestock Research Institute. At the National Rangeland Forum in 2018, Prof. Dube said, “The lack of market access, prolonged dry seasons, livestock deaths and poor income are all key challenges that smallholder farmers face, with climate change as an added threat to agricultural productivity. There are, however, solutions for smallholder farmers to break out of poverty.” Prof Dube, who worked in the northern regions of Namibia, shared his experiences of crop and livestock farming in Zimbabwe, Swaziland, Malawi and Mozambique.

Prof. Dube indicated that four of the five highest-value global agricultural commodities (milk, rice, pigs, cattle and chicken) are from livestock. He emphasised the importance of agriculture and added that 4 billion people who live on less than US$10 a day (primarily in developing countries) represent a food market of about $2.9 trillion per year, with an asset value of $1.4 trillion that employs at least 1.3 billion people. There is also massive potential for growth, with expected annual meat consumption increasing from 258 million tonnes in 1997 to 460 million tonnes in 2050.

The livestock sector can provide food and nutritional security; power economic development; improve human health; and enhance the environment. Prof. Dube warns, however, that the livestock sector must be developed equitably, while mitigating possible health and critical environmental issues.

Feed Options for Cattle

“Cattle depend on natural pasture as a main source of feed, but the protein content of grass declines in the dry season. To boost the protein intake of livestock, it is a good idea in certain parts of the country to supplement their feed with...”
forage legumes and crop residues such as groundnut, maize stover, and Mucuna hay reserved from the farmers’ previous harvests.”

Prof. Dube conducted a feed ration experiment for 56 days with maize stover offered ad libitum in various ratios with crushed maize, soya bean meal, soya bean residue, Mucuna hay, Mucuna seed, Lablab hay, cowpea shells, groundnut residue, maize stover, poultry litter, beef concentrate, minerals and vitamins. The results were that the body weight of cattle fed on rations based on Lablab/cowpea, Mucuna and groundnut stover were significantly higher than that of commercial feeds or grass-fed cattle. Looking at the gross margin analysis of all the different feed rations, Mucuna was the costliest option, but it achieved the highest gross profit margin per animal.

**Forage Seed Production**

Prof. Dube also suggested that forage seed production should be investigated in some parts of Namibia to improve pastures and provide fodder for livestock, improve soil (nitrogen fixation from legume crops, crop rotations, cover crops, etc.), and diversify farm income sources.

The crops with the best gross margin were Lablab and Mucuna (velvet bean), followed by cowpea. It was widely adopted in Zimbabwe where it was planted in rotation with cereals. After planting Mucuna, farmers found that the soil was significantly more fertile as a result of nitrogen fixation. They also realised that Mucuna seeds have a market value and started selling it to other farmers and development organisations. Indicative of the value farmers place on forage plants, Mucuna seeds sold in 2014 in the Beitbridge area generated US$11 000. In 2018, seed sales for that area amounted to approximately US$50 000.

**Mini-Feedlot**

Prof. Dube also shared his experience in the establishment and running of small feedlots as a registered company in the communal setting. These feedlots are small and not costly, but are proving to be very effective for the finishing of animals on a relatively small scale in a sustainable and viable way, with inputs grown by the farmers or surrounding farmers.

**Conclusions**

In conclusion, Prof. Dube indicated that Mucuna- and groundnut-based diets produce viable returns when fed to livestock, and that these technologies are easily adopted by smallholder farmers. He said that supplementing beef cattle using alternative protein sources grown in the location is a viable option in smallholder systems. Prof. Dube is of the view that the private sector and other market players need to be involved to strengthen the market.
The hope and future of tomorrow’s livestock production may well hinge on good rangeland management and the decisions made today in order to protect the natural resources necessary for the sustainable production of livestock in Namibia. At the National Rangeland Forum, held at the end of November 2018, various successful approaches of rangeland management and approaches for livestock profitability were presented. Currently, two factors hamper livestock production in Namibia: marketing issues and the declining productivity of rangelands. As farmers have little control over marketing, they should focus on increasing the production and profitability of their livestock enterprises. A vital part of achieving livestock profitability is to improve the way farmers manage their rangelands. This is a combination of efficient rangeland management practices and bush thinning and landscape rehydration where required.

Jerome Boys of the MAWF said that if the basic principles of sound rangeland management are applied, farmers will be able to reverse the deplorable state of the country’s rangelands.

Colin Nott stressed the relative importance of the main drivers of livestock profitability, stating that improved sustainable stocking rates through sound rangeland management is 8 times more important than any other factor.

The farm on the right-hand side is stocked at double the government recommended stocking rate with adequate rest, and through planned grazing has perennial grass and little bush encroachment; the farm on the left-hand side has half the government recommended stocking rate, with no perennial grass and thickened bush.
Namibia consists of 28 million ha of commercial land, 26 million ha of communal land and 6.3 million ha of emerging farmland. As some 80% of Namibian livelihoods and 64 million ha of Namibia’s land surface is dedicated to livestock production, it is therefore prudent to ensure the sustainable and wise management of this resource base. Incentives, if applied correctly, have the ability to create an ever-improving cycle of productivity. With regard to climate change and the current widespread application of practices that are causing further degradation, this situation will only get worse as rainfall becomes more variable, less effective and more unpredictable, resulting in hotter drier conditions that render plant and animal growth more challenging. Combined with increased droughts and floods, this will result in the further decline of the livestock industry.

It is therefore important to make improved rangeland management effective and affordable through an incentive scheme that delivers increased primary production, increased income and profits, growth of the sector, and national contribution to the economy. Improved rangeland productivity and profitability improves food security, quality of life (farmers and supporting industries) and the national economy; and it increases sustainable job creation, exports and value addition, as well as tax revenue.

The incentives introduced must result in a carbon-friendly industry that produces healthy landscapes, delivers effective ecosystem services, and produces healthy food for the market.

A suite of policies and acts supported by incentives that support rangeland recovery is required. There are two key steps for the introduction of incentives. These two key steps include the following:

• The first step is to remove current practices, policies and incentives that are doing the most harm to the livestock sector.

• The second step is to identify the key factors that will create success in the livestock sector, and to put meaningful measures, in support of these factors, in place in order to increase investment in and the sustainable growth of the livestock sector.

Incentives can include preferential loans, grants, tax rebates, market prices, support for improved management capability, and rangeland repair actions. Disincentives can also be introduced, which are intended to penalise farmers who, for example, do not undertake regenerative action in a given time period.

Farmer level incentives must be simple, measureable, fair, and applicable. They must address management capacity and rangeland repair, and produce outcomes that include desired rangeland condition, desired economic and social impact, and that meet market conditions. The incentive programme must reward management action and rangeland condition improvement; and it must enable desired management actions, and be in support of market needs. Incentives encourage the sector to move in the right direction, willingly.

A number of potential incentives were identified during the project period. These include the following:

1. The use of an existing Act, or the development of an enabling Act, through consultation, to enable grazing planning to be enforced in the communal areas, which is ‘nested’ within Namibia’s existing communal resource tenure system, such as community forests and communal conservancies.

2. The development of government procurement of Northern Communal Areas’ C grade meat at existing AB grade prices. This would compensate NCA farmers who are not able to access the high value markets south of the veterinary cordon fence.

3. Farmers who apply either the accredited practices or the principles of healthy rangeland management should be compensated through:
   a. reduced/low interest loans for infrastructure and livestock purchases;
   b. tax rebates for selling livestock for forage shortage reasons, as this affects profitability because animals are sold when they are not yet ready for market;
   c. subsidies for applying accredited practices (e.g. correcting bush densities);
   d. the establishment and support of revolving funds that result in increased sustainable stocking rates; and/or
   e. the establishment of infrastructure in support of ecological...
factors (e.g. water infrastructure, firebreaks, landscape rehydration, filter systems, etc.).

4. Development of agreements and partnerships in the livestock sector, which could include the following:
   a. Long-term contractual agreements where operators and investors share profits
   b. Corporate social investments encouraged to invest in accredited methods
   c. Government financial assistance to kick-start communal regenerative practices
   d. Percentage land tax reduced based on the application of accredited principles, bush-thinned areas, and/or implemented landscape rehydration
   e. Government pays for land owner services provided

5. Technical and financial assistance through accessing donor grants and support in order to help farmers apply accredited practices or principles, and respond to livestock industry needs.

6. Land tax increase if no accredited management practices are applied.

7. The establishment of sustainable funding sources that can, for example, pay for environmental services to undertake restoration.

8. Price premiums and markets must be sought in support of the application of accredited principles and/or practices.

9. The development of high value encroacher bush products to increase income in support of regenerative management.

3.1. Shortcoming analysis of enabling procedures and incentives

A closer look at title deed and non-title deed (communal) areas has revealed that there are shortcomings regarding the existence of enabling procedures and incentives.

The identified enabling procedure and incentive shortcomings and approved suggestions that affect (either negatively or positively) both title deed and non-title deed areas include the following:

1. **Non-title deed and title deed farmer representatives** indicated that the current market incentives that apply during extreme forage shortages (droughts) are bad for farmers’ income (because incentives arrive only well into the drought period when animals are already in poor condition, and farmers receive low prices); bad for the resource base (because livestock have been on the land far longer than is desirable, and overgrazing has occurred and soil litter cover has been licked up); and bad for the market (because the animals purchased are of low quality with limited use, and many die en route to the abattoir).

2. **Non-title deed and title deed farmer representatives** felt that the government and market and banking systems must develop incentives that support the adoption of sound rangeland management principles and practices. Low interest loans should be investigated that support business plans developed in support of sound rangeland principles and practices. National incentives need to be developed that encourage investment in the livestock sector, as these are vital for the recovery of the sector.

3. **Non-title deed and title deed farmer representatives** indicated the critical need to stop communication that includes out-dated rangeland management recommendations that refer to fixed stocking rates and fixed rotations. Instead, information dissemination must refer to the need for destocking and restocking in relation to forage availability. This will be particularly important after the current drought, when livestock owners will need support with restocking their herds and applying healthy rangeland management practices.

4. **Non-title deed and title deed farmer representatives** felt that there is a lack of coordination between support organisations, and a lack of policy harmonisation in the communal and title deed areas, particularly in relation to livestock, cropping, wildlife and tourism.

5. **Non-title deed and title deed farmer representatives** supported the development of tax incentives for the destocking and restocking of livestock due to forage shortages.

6. **Non-title deed and title deed farmer representatives** supported the introduction of a national livestock early warning system that triggers early sales of livestock when forage shortages are detected, with market incentives to encourage early removal of animals when they are in good condition in order to benefit the farming process, to benefit the land (no overgrazing and licking up of soil litter cover), and to benefit the market and economy (livestock will be in good condition and will have better quality grades).
Title Deed Areas

The following identified enabling procedures and/or incentive shortcomings and harmful actions need to be either supplied or removed, or adjusted:

1. Current support mechanisms for title deed areas are not adequate enough to enable farmers to recover from their current financial circumstances, resulting in ineffective contributions to the industry.

2. The lack of markets for small- and/or medium-framed animals results in penalties having to be paid for these carcasses. However, these animals can be very appropriate for many farms and can also be very profitable.

3. Migratory game poses a major problem with regard to the successful application of a grazing plan. Adjusting these numbers in line with available forage is critical, and removal through the export of game meat is required. Predators are a major problem, and numbers need to be controlled and markets sought for their purchase and/or use.

4. Border restrictions with Botswana and other countries need to be reviewed to allow the movement of animals between these disease-free areas, and to open these areas up to enable cross-border movement and/or purchase of livestock.

5. The establishment of successful on-farm examples that show real results in terms of increased production, improved resource base, and improved quality of life needs to be supported. Working and successful examples of each accredited method and/or principle needs to be established.

6. The current limited knowledge concerning Namibia’s carbon balance and the impact of the application of carbon-related principles and practices needs to be determined. Likewise, there is a lack of knowledge concerning the ‘bush to feed’ practice, which needs to be investigated in order to make it more efficient.

The following actions and incentives are required:

Throughout the devastating drought cycle, most farmers have realised how financially valuable rangeland forage reserves are. Therefore, the ability to overcome recurring lower rainfall years with resilient rangelands that can withstand these unfavourable climatic conditions is imperative. As the current drought has clearly called attention to the value of the resource base, it provides a good opportunity to approach farmers and bring about change. For the success of the livestock sector, it is critical that regenerative and profitable principles and/or practices are incentivised, wherever possible, by government projects, banking institutions and the market.

The following primary actions regarding title deed areas are being currently addressed:

1. The application of accredited regenerative principles and/or practices should be incentivised through markets that pay premiums for these actions taken. This is vital because the industry would be investing in its future, and it will assist farmers with adopting good practices that are profitable for themselves as well as the industry. Incentive schemes must be market-related, and it must be relatively easy for farmers to enter into these incentive schemes. However, they must also include benefits for the regeneration of the landscape in terms of real change in soil cover, and increased plant biodiversity and productivity. These schemes must be bold and they must pay more for increased and greater results, which must be verified by an independent entity.

2. Particular focus must be placed on incentivising planned grazing (with recovery built into each season or full-season recovery), which may be combined with bush thinning, landscape rehydration, and/or increasing biodiversity through seeding.

3. Loans for targeted actions which enable these accredited principles and/or practices should offer lower interest rates and more favourable terms. The development of business plans that clearly identify aspects that will increase profitability and reduce bank risks needs to be encouraged. The business plan could include infrastructure that will enable a grazing plan to be implemented, livestock required to utilise the grass effectively, bush thinning, landscape rehydration costs, etc.

4. Equitable partnerships between all land types should be encouraged and supported in a win-win manner, which will enable more flexibility and promote the adoption and application of the principles of sound rangeland management throughout Namibia.

5. A drought recovery plan is required to restock the country, using sustainable and profitable methods.

6. Establish a sustainable funding source from carbon taxes in support of carbon-positive enterprises, revolving funds, ecological compensation funds, payment for ecosystem services, and union operational costs.

7. It is suggested that farmers should aim to adopt the relevant certified practices and/or principles within five years. Thereafter, additional steps should be considered to ensure that the land is being utilised sustainably.

In addition to the title deed areas, requirements specific to the Emerging Commercial Farming sector were raised. These requirements include the following:

1. Group resettlement needs to be reviewed and stopped if issues such as loss of control, poor management, and limited maintenance cannot be addressed.

2. It is proposed that the minimum farm size for viable units is adhered to, with recommendations of 2500ha in the central regions and 10000ha in the south, in order to ensure that economically viable units per geographic area are resettled.

3. A pre-resettlement assessment should be conducted to ensure that resettled candidates are fit for resettlement. Resettlement should take place immediately after purchase and upgrades to avoid the deterioration of infrastructure.
Non-title Deed Areas (Communal Areas)

The following identified enabling procedures and/or incentive shortcomings and harmful actions need to be either supplied or removed, or adjusted:

1. Drought relief for the Northern Communal Areas is particularly ineffective and needs to be urgently reviewed.

2. The small- and medium-frame penalties for the communal areas need to be removed. It is these animals and grades that are the most profitable to produce on a degraded resource base.

3. The current restrictions concerning bush utilisation need to be urgently reviewed, and mechanisms need to be put in place to ensure that healthy rangeland practices are applied where selective thinning is deemed necessary to increase livestock productivity.

4. There is a lack of coordination between support organisations, and a lack of policy harmonisation in the communal areas, particularly in relation to livestock, cropping, wildlife and tourism.

5. The establishment of successful on-farm examples that show real results in terms of increased production, improved resource base, and improved quality of life needs to be supported. Working and successful examples of each accredited method and/or principle needs to be established.

The following actions and incentives are required:

1. The use of an existing Act, or the development of an enabling Act, through consultation, to enable grazing planning to be enforced in the communal areas, which is ‘nested’ within Namibia’s existing communal resource tenure system, such as community forests and communal conservancies.

2. The development of government procurement of Northern Communal Areas’ C grade meat at existing AB grade prices. This would compensate NCA farmers who are not able to access the high value markets south of the veterinary cordon fence.

3. Mechanisms that mitigate the impact of the Foot and Mouth zone should be investigated, rather than changing the status of the region and/or moving the fence.

4. The introduction of scaled market incentives that support the registration of grazing areas in the communal areas and the application of accredited principles and/or practices, and market incentives that reward measurable changes in the resource base. These incentives will drive the registration of grazing areas, and promote a sustainable livestock industry in the communal areas.

5. The development of existing markets for communal livestock within Namibia, and sourcing new markets abroad that will purchase C grade meat and small carcasses.

6. Investigate value addition and price premiums for accredited farming practices and principles as well as grass-fed beef and organic beef.

7. Equitable partnerships between all land types should be encouraged and supported in a win-win manner, which will enable more flexibility and promote the adoption and application of the principles of sound rangeland management throughout Namibia.

8. Establish a sustainable funding source from carbon taxes in support of carbon-positive enterprises, revolving funds, ecological compensation funds, payment for ecosystem services, and union operational costs.

9. Source funding for the execution of the transformative proposal that was developed for the NCAs, which needs to be undertaken by the NNFU and partners. Similar proposals appropriate to the other communal areas in Namibia need to be developed and implemented to ensure that all communal areas in the country can move forward.

10. A drought recovery plan, in conjunction with the application of regenerative principles and practices, needs to be supported for the communal areas.

11. The government and all other support entities need to align implementation with the development of incentives that encourage the adoption of regenerative principles and practices. These should include the provision of water points that enable sound rangeland management to be practiced. This could include conditions of developing and applying a grazing plan as well as the adoption of water point standards for livestock production developed under the MAWF/MCA initiative. These standards include multiple troughs within kraals, high delivery from the reservoir to troughs, as well as solar installations wherever possible.

12. Mechanisms that create a direct link between livestock, rangeland management and communal conservancies need to be investigated. There is great potential for mitigating the existing human-wildlife conflict in communal areas if these sectors combine their efforts and establish equitable distribution plans.
4. UPSCALING

As most Namibian farmers do not apply sound practices and/or principles, this affects farming in all title deed and communal areas, which cover 60 million ha of Namibia’s land surface. The task to mobilise all farmers in Namibia is a mammoth one, and it cannot be achieved without the introduction of strategic incentives that enable them to change their practices. Also, the task cannot be achieved if farmers in title deed and communal areas are not effectively supported throughout the entire farming livestock industry, at a relatively cheap cost. Unfortunately, existing one-on-one methods of training and support have not always been effective: they have not reached enough people and they have not provided ongoing adequate and effective support over time.

However, all unions are positive about the investigation into the establishment of an industry-wide electronic platform for the provision of critical information and support.

This platform must be industry-linked, and it must have close relations with all unions, ministries and state-owned enterprises. Efforts are underway to seek clarity on how such a body could be established, how it would be used, and how farmers’ on-farm experiences and ground-truthing would be built in.

This platform does not replace extension and mentorship; instead, it compliments them and helps guide farmers to move at their pace.

**This platform will assist with and provide the following:**
1. It will enable farmers to register.
2. It will provide information concerning their social, environmental and industry conditions.
3. It will be able to provide all the information in this strategy document and other documents, which farmers can access in their own time. This includes the principles of sound rangeland management, the four key factors of livestock success, best practices, as well as critical information relating to farmland and its potential.
4. It will support farmers with developing a grazing plan as well as a business plan, which will result in increased profits over time.
5. If the industry supports these plans, it will link farmers to products developed specifically to support their recovery and the adoption of regenerative principles.
6. It will provide tools that support day-to-day management, such as stocking rate calculators, regional and national status of forage availability, soil and rainfall predictions, etc.
7. It can respond to any need expressed by any stakeholder.
8. It will provide real-time status of the sector, and enable the monitoring of progress towards set goals.

Farming in the age of smart phones

As we live in a time of innovative and exciting electronic and technological development, the increase in business being conducted by means of today’s variety of mobile phone is not surprising. In this regard, Steve Carver presented an interesting and enlightening presentation at the Rangeland Forum in 2018. The following is a summary of Steve Carver’s presentation:

“Mobile phone technologies are presenting farmers with unprecedented opportunities to run their operations more productively and grow their income. It is radically changing the face of the world.” – Steve Carver, founder and chairman of Win:Win Earth

Steve Carver pointed out the benefits of using technology for farm management and linking stakeholders in the industry to the farmer. He explained that an industry platform would give farmers access to 35 years of satellite-based records for weather conditions and temperatures. It would also assist with crop and input choices, decrease risks, increase yields and revenues, and provide access to communications, technical advice and crop insurance.

“Precision farming, the way we farm, the inclusivity of farmers and the inclusivity of women in farming is happening through mobile phones. It is one of the most important things in creating prosperity for Africans.”

Steve Carver illustrated the crucial role of cellphones and an industry-based platform to transform the agricultural sector in Namibia.

**Grassland management**

“The management of grasslands to ensure the regeneration of high quality grass for cattle to feed off can be achieved through Google Internet of Things.” Steve explained that the ongoing movement of cattle and the management and timing of when
to move them away from certain grazing areas is critical for the sustainability and productivity of grasslands. To this end, an App on mobile phones will give farmers information such as the location and stress levels of the animals. This data can then be downloaded onto a computer, for which a platform is created, to enable farmers to manage their rangeland from anywhere.

**Micro-jobbing**

Steve communicated the importance of mobile phones in micro-jobbing, -learning, and -financing. With the concept of micro-jobbing, people in remote areas can use a dynamic mobile platform that allows them to complete tasks. They are then rewarded for their efforts through a verification system. *Win:Win Earth*, for example, designed an App for 6 500 small-scale producers of chilli plants for the *Tabasco* product. Through mobile phone photographs, producers are able to show evidence of the work they have done. Money is then transferred to them via their phones from the manufacturers. “This system also ensures traceability of the product. Today’s consumer wants authenticity, fairness and trust. They also want to know that producers are benefitting from their purchases. It is not just about the product anymore; it is the stories about the product that are becoming valuable.”

The following illustration demonstrates how the simple task management and reward incentive platform works.

**Eye in the sky**

Another powerful tool that can be used, especially in conservation, is the American military intelligence tool, *Eye in the Sky*, which picks up data from mobile phones. For example, if a mobile phone owner goes off a road for more than five minutes, alarms will go off, alerting conservationists of possible poaching activity. Another way to use mobile phone information and social media in conservation is by pulling together a series of photographs, taken by different people, of the same animal. Tracking animals becomes unnecessary because they can be geo-located on a map. In this way, information of an animal can be pooled and used.

**Harvest Plus**

After trials and projects, which looked at using technology to increase yields and revenues of small-scale farmers, mitigate risk, improve food security and achieve sustainable farming communities, were conducted in Mozambique and Malawi with approximately 30 000 farmers, *Win:Win Earth* developed a model called Harvest Plus. This model is a web-based IT system and knowledge management platform that combines the critical aspects of the smallholder agri-business model and provides a dynamic, knowledge-rich environment and system for all stakeholders and partners to interact in. The system includes technical data on soils, weather conditions, evapotranspiration, training, grower details, financial modelling, crop insurance, markets and pricing, communications, strategic analysis and reporting, and corporate social responsibility.

The system receives and combines live and updated satellite information, as well as data from leading international and research institutions, to allow for ‘real time’ analysis, scenario planning, forecasting and decision making, pre-planting and planting, and decision making support during the growing season. Feedback loops and data management through simple practical steps make it a powerful and dynamic business tool.

**Earn and learn**

“We discovered that education is more important than money among the young herdsmen in northern Namibia. They want better jobs and better lives.” According to Steve, the majority of the herdsmen come from Zambia. They are also the lowest income earners in the country because of their illegal immigrant status. These workers can learn and, at the same time, earn money through incentive programmes. Additionally, their observations could be valuable for conservationists. They can, for example, report on snares and elephant and predator movement to create an animal warning system, as well as provide information on cattle. In this way, they can play a dual role in assisting with conservation as well as herding cattle.
In addition, Harvest Plus provides farmers with a platform to address, manage, monitor and report on major areas and challenges. This platform is important for farmers as it can assist them with achieving food security, increasing productivity and incomes, mitigating risk at multiple levels, managing social and environmental projects, and ensuring successful and sustainable farming. By using Harvest Plus, farmers can correct input package selection and plan timely planting, which can result in significant maize yield increases of up to 50%. “An advantage of Harvest Plus is that it picks up conditions through technology that are not detectable with the naked eye. For instance, it was found that marijuana plants have different chemical compositions at different altitudes,” Steve explained.

Steve concluded his presentation with the following aspiration: “We hope that our products will contribute to improved food security, economic growth, increased incomes and rural resilience, thereby positively impacting the lives of millions of Africans.”

5. CONCLUSION AND WAY FORWARD

Namibia’s rangeland resource base is now only able to sustain a half to a third of the animals that it could 50 to 100 years ago. The root cause of this decline is poor rangeland management practices. This strategy document has established that the knowledge and experience to reverse this trend exists within Namibia and abroad, and that there is broad Namibian industry support for this strategy to be carried out.

Namibia has approximately 60 million ha of degraded rangelands where livestock production takes place, of which 45 million ha is encroached by bush. Productivity of this land can be restored by allowing forage plants adequate time to recover between grazing intervals. As a result, year-round soil cover will be achieved and plant biodiversity will increase over time, which promotes improved soil carbon, improved soil structure, improved water holding capacity and improved soil micro-biomes. In due course, the net primary productivity of the land will be improved and the country’s sustainable stocking rates will be restored. However, sound rangeland management practices will only be effective if they are combined with selective bush thinning practices in heavily encroached areas and with landscape rehydration practices in steeper areas where gullies have formed.

Real on-farm case studies from title deed areas in Namibia have shown that if bush-thickened areas are strategically thinned and linked to sound rangeland management practices, stocking rates per ha and livestock production per ha can be doubled. If these on-farm results are applied to half of Namibia’s rangelands (30 million ha), costing ± N$30 billion to regenerate, the financial impact would be as follows:

1. Potential increase in kg live weight produced per ha = 5 kg/ha x 30 million ha = 150,000 tons of live weight (75,000 tons of additional beef carcass weight) per annum
2. 75,000 tons of beef carcass weight at current producer prices = N$3 billion per annum

Revitalising the Namibian livestock industry is technically possible, and it is now clear that this is economically viable.

The current extended drought in Namibia has drastically reduced livestock numbers and depleted farmers’ financial reserves. Most communal, emerging and commercial farmers will need support in order to recover from this drought. This provides a vital opportunity for the sector to incentivise regenerative practices and restocking of the sector, leading to the revitalisation of the entire livestock sector.

Firstly, Namibia needs to develop and adopt Namibian livestock production standards that allow price incentives to be paid to farmers for the adoption and application of the non-negotiable needs of forage plants. This will promote the large-scale uptake of practices that are highly profitable for the farmer, and it will result in the sustainable growth and increased resilience of the livestock industry as a whole.

Secondly, the communal areas of Namibia, which constitute 30 million ha, require particular additional attention in order for the livestock industry in these areas to recover sustainably. Unlike title deed areas, communal areas do not have the enabling environment to apply and enforce grazing plans. This situation must be addressed in synergy with existing communal resource management legislation to ensure the sustainability of the communal area livestock sector. The full implementation of the Ministry of Finance’s directive to purchase C grade meat from northern communal farmers through government procurement procedures at current prices will be the first vital step towards securing a market for these farming communities in the Foot and Mouth zone.

Thirdly, the financing sector needs to consider favourable communal and title deed loans that arise from business plans in support of the application of the non-negotiable needs of forage plants. The government will need to investigate the provision of support to those framers who apply regenerative principles, and this could, for example, include the provision of water infrastructure. All government and donor interventions should consider how the application of these initiatives can incentivise and increase adoption of the regenerative principles. For the future, it is also important to investigate and introduce the development of tax incentives in support of regenerative practices.

Lastly, the MAWF needs to re-allocate funds to establish a Livestock Production Directorate, and the NNFU, NECFU and NAU need to establish sustainable funding sources to continue the implementation of this strategy document into the future.

The future success of the Namibian livestock sector will depend on the how effectively all key industry players organise themselves and engage with the incentive development scenarios included in this strategy document, and whether support to
farmers throughout Namibia can be coordinated and up-scaled by the development of a livestock industry electronic platform. If there are no market-related incentives to produce regeneratively and if communal areas do not have a simple production-based mechanism to apply a grazing plan, the Namibian livestock industry will continue to decline.

However, if Namibia succeeds in applying this strategy and achieves increased year-round soil cover and an increase in the number of plants above and below ground, Namibia’s forage yield and livestock production will increase sustainably. This will also result in healthy soils, plants, animals and people, as well as improved water quantity and quality on farms and in towns.

If done correctly, improved rangeland management can make the livestock industry more resilient, more profitable for the farmer, healthy for the consumer, good for the Namibian economy, and good for the planet.

6. REFERENCES

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Contact details

Ministry of Agriculture Water and Forestry
Directorate of Agricultural Production Extension and Engineering Services (DAPEES)
Directorate of Agricultural Research and Development (DARD)
Directorate of Forestry
Switchboard: 061 208 7111

Namibia National Farmers Union (NNFU)
Tel: 061 27 1117

Namibia Emerging Commercial Farmers Union (NECFU)
Tel: 061 23 7838

Namibia Agricultural Union (NAU)
Tel 061 23 7838