

9.3.9. Association 9: *Lonchocarpus nelsii* - *Eragrostis rigidior* low moderately closed bushland

This vegetation association prefers somewhat moister climates, and first becomes conspicuous south of Otjiwarongo. A typical feature here is a change from only microphyllous trees to also some broad-leaved trees, of which the most striking is *Lonchocarpus nelsii*. In addition, where *Acacia mellifera* is the primary species leading to bush encroachment in the previous vegetation associations - here the main encroacher becomes *Dichrostachys cinerea*. Farmers report that when there is sufficient frost during the winter, *Dichrostachys* is severely affected. This was also observed during the study - many shrubs observed as up to 2 m high in 2001 consisted mostly of dead material in 2002. However, resprouting was in general of such a nature that it can be assumed that these shrubs will have reached their original height again in one to two years, unless another winter occurs with several frost-events.

Overall this association is seen as a transition to the more “Karstveld” -like associations of the northern study area, which is reflected in its variable nature. Occasionally, small patches of *Terminalia sericea* and *Acacia erioloba* can be found, which are more typical of association 8, while *Terminalia prunioides*, which is more typical for the Karstveld and Mountain Savanna bordering onto the northern part of the study area, can be found in this association as well.

Soils found in this association vary from loamy sand to sandy loam, with the underlying geology consisting of calcretes, undifferentiated metamorphic rocks and quartzites of the Damara Sequence. Occasionally the Omingonde Formation is present as well. Soil types are relatively varies, the most predominant being the chromic Cambisols with leptic Regosols and petric Calcisols Complex, while the chromic Cambisols and leptic-chromic Cambisols Association as well as the leptic Regosols with haplic Regosols and petric Calcisols Complex also occur. Average long-term rainfall ranges from 400 - 490 mm p.a.

The predominant species are listed in Table 15, while the vegetation composition in terms of layers is represented in Figures 26a and 26b. The list of diagnostic species has been indicated on Table 27 (Appendix 1.2.).

Table 15: Abundance and cover percentages of predominant species of the *Lonchocarpus nelsii* - *Eragrostis rigidior* vegetation association

Species	abundance (% of samples)	average % cover	layer
<i>Dichrostachys cinerea</i>	96	13.5	high shrub
<i>Pogonarthria fleckii</i>	90	1.7	annual grass
<i>Eragrostis rigidior</i>	81	9.7	perennial grass
<i>Acacia mellifera</i>	78	4.7	high shrub
<i>Eragrostis trichophora</i>	78	3.9	perennial grass
<i>Evolvulus alsinoides</i>	78	0.1	herb
<i>Melinis repens ssp. grandiflora</i>	71	0.1	annual grass
<i>Ipomoea obscura</i>	71	0.3	herb
<i>Grewia bicolor</i>	68	2.4	high shrub
<i>Eragrostis porosa</i>	68	1.5	annual grass
<i>Commelina benghalensis</i>	68	0.1	herb
<i>Aristida congesta</i>	65	3.0	perennial grass
<i>Grewia flava</i>	65	2.7	high shrub
<i>Lonchocarpus nelsii</i>	65	2.3	low tree
<i>Acacia reficiens</i>	62	2.8	high shrub
<i>Aristida adscensionis</i>	62	1.2	annual grass
<i>Hibiscus elliotiae</i>	62	0.2	low shrub
<i>Pupalia lappacea</i>	62	0.2	low shrub
<i>Talinum arnotii</i>	62	0.2	herb
Total nr of species recorded	234		
Average % cover per sample		83.7	

Other important species include *Enneapogon cenchroides*, *Stipagrostis uniplumis* and *Monechma genistifolium* with high shrubs of *Acacia fleckii*, *Albizia anthelmintica*, *Combretum apiculatum* and *Grewia flavescens* var. *ohukondae*. Further common species include: *Dicoma tomentosa*, *Oxygonum simuatum*, *Vernonia poskeana*, *Barleria lanceolata*, *Clerodendrum ternatum*, *Commiphora pyracanthoides*, *Hibiscus calyphyllus*, *Ipomoea verbascoidea*, *Megalochlamys marlothii*, *Ptychobium biflorum* and *Solanum kwebense*.

The diversity of shade-loving plants is relatively high in this association. Species such as *Hibiscus calyphyllus*, *Commelina benghalensis*, *Megalochlamys marlothii* and *Digitaria velutina* can be found under almost all denser groups of trees. The wide-spread occurrence of *Pupalia lappacea* - listed by Craven and Kolberg (1999) as an exotic species is especially pronounced in this vegetation type. *Geigeria acaulis* appears to be a common poisonous plant, as are *Crotalaria* spp.

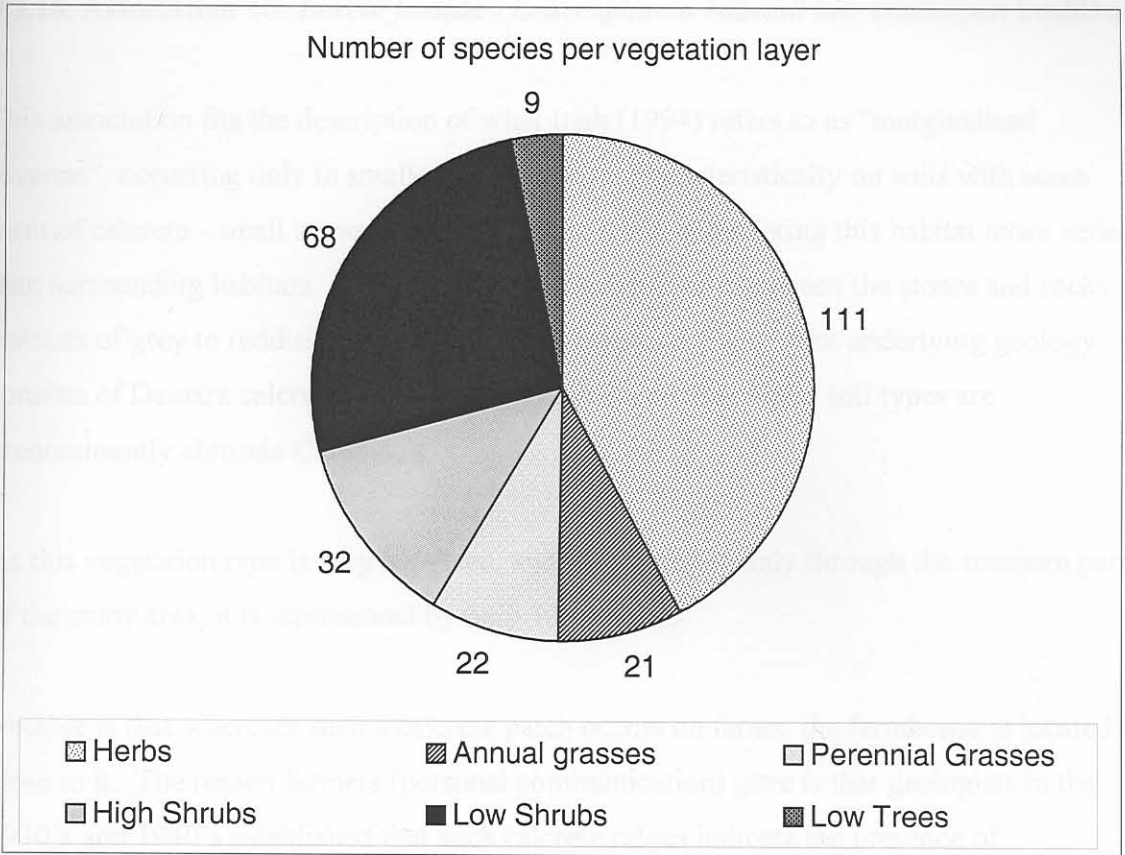


Figure 26a: Pie chart showing the total number of species recorded for each vegetation layer in association 9.

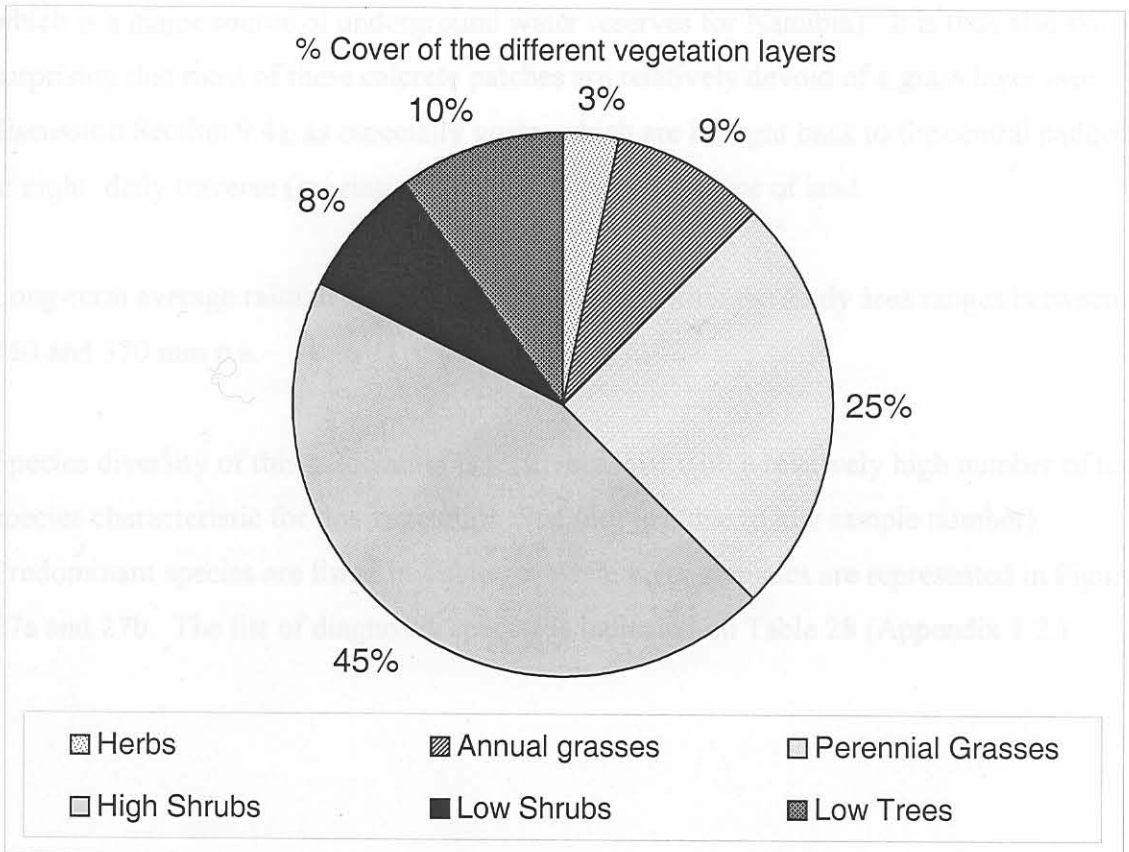


Figure 26b: Pie chart showing the average percentage cover each layer contributes to the total vegetation cover of association 9.

9.3.10. Association 10: *Boscia foetida* - *Leucosphaera bainesii* low semi-open bushland

This association fits the description of what Irish (1994) refers to as “marginalised savanna”, occurring only in smaller patches, very characteristically on soils with some form of calcrete - small stones to rocks - on the surface, rendering this habitat more xeric than surrounding habitats. The soil texture of soil pockets between the stones and rocks consists of grey to reddish-grey loam and/or sandy clay loam. The underlying geology consists of Damara calcretes or the Omingonde Formation, while soil types are predominantly chromic Cambisols.

As this vegetation type is very localised, and distributed mainly through the southern part of the study area, it is represented by only 10 samples.

Notable is that wherever such a calcrete patch occurs on farms, the farmhouse is located close to it. The reason farmers (personal communication) gave is that geologists in the 1930's and 1940's established that such calcrete ridges indicate the presence of underground water (compare to the Karstveld, with large tracts of calcrete and dolomite, which is a major source of underground water reserves for Namibia). It is thus also not surprising that most of these calcrete patches are relatively devoid of a grass layer (see discussion Section 9.4), as especially goats, which are brought back to the central paddocks at night, daily traverse (grazing off and trampling) this piece of land.

Long-term average rainfall for this vegetation type within the study area ranges between 350 and 370 mm p.a.

Species diversity of this association is relatively low, with a relatively high number of total species characteristic for this vegetation type (not just due to low sample number).

Predominant species are listed in Table 16, while layer-statistics are represented in Figures 27a and 27b. The list of diagnostic species is indicated on Table 28 (Appendix 1.2.).

Table 16: Abundance and cover percentages of predominant species of the *Boscia foetida* - *Leucosphaera bainesii* vegetation association

Species	abundance (% of samples)	average % cover	layer
<i>Stipagrostis uniplumis</i>	100	13.8	perennial grass
<i>Enneapogon desvauxii</i>	100	6.5	perennial grass (or biennial)
<i>Enneapogon cenchroides</i>	100	4.3	annual grass
<i>Cenchrus ciliaris</i>	100	3.9	perennial grass
<i>Leucosphaera bainesii</i>	100	3.0	low shrub
<i>Monechma genistifolium</i>	90	9.5	low shrub
<i>Eriocephalus pubescens</i>	90	1.1	low shrub
<i>Eragrostis echinochloidea</i>	90	0.5	perennial grass
<i>Melhania virescens</i>	90	0.3	low shrub
<i>Catophractes alexandri</i>	80	12.1	high shrub
<i>Acacia mellifera</i>	80	4.5	high shrub
<i>Peliosostomum leucorrhizum</i>	80	1.1	herb
<i>Sericorema sericea</i>	80	0.4	herb
<i>Otoptera burchellii</i>	80	0.4	low shrub
<i>Seddera suffruticosa</i>	80	0.2	low shrub
<i>Eragrostis porosa</i>	80	0.1	annual grass
<i>Acacia reficiens</i>	70	0.9	high shrub
<i>Boscia foetida</i>	70	0.4	high shrub
<i>Barleria lanceolata</i>	70	0.2	low shrub
<i>Lycium eenii</i>	70	0.2	low shrub
<i>Fingerhutia africana</i>	70	0.2	perennial grass
<i>Ocimum americanum</i>	70	0.1	herb
<i>Aristida adscensionis</i>	60	1.0	annual grass
<i>Grewia flava</i>	60	0.5	high shrub
<i>Sida ovata</i>	60	0.4	low shrub
<i>Leucas pechuelii</i>	60	0.2	low shrub
<i>Eragrostis jeffreysii</i>	60	0.1	perennial grass
<i>Aizoon virgatum</i>	60	0.1	low shrub
Total nr of species recorded	97		
Average % cover per sample		70.1	

Other commonly encountered species with varying cover percentages are: *Eragrostis annulata*, *Oropetium capense*, *Stipagrostis hirtigluma*, *Boscia albitrunca*, *Kleinia longiflora* and *Lycium* spp, while a species such as *Hermannia damarana* was only found within this association.

One interesting observation: while *Leucosphaera bainesii* occurs in much higher densities in other vegetation types - only here this shrub (considered in southern Namibia as one of the more valuable fodder shrubs) was visibly being utilized. A viable explanation for this could not be established - possibly the daily grazing patterns by goats. Likewise, wherever *Boscia albitrunca* was only a shrub, it was likely to remain such due to grazing impact. Such shrubs often had very gnarled low stems, and were at times difficult to distinguish from *Boscia foetida*.



Figure 2: Pie chart showing the average percentage cover each layer contributes to the total vegetation cover of association 11.

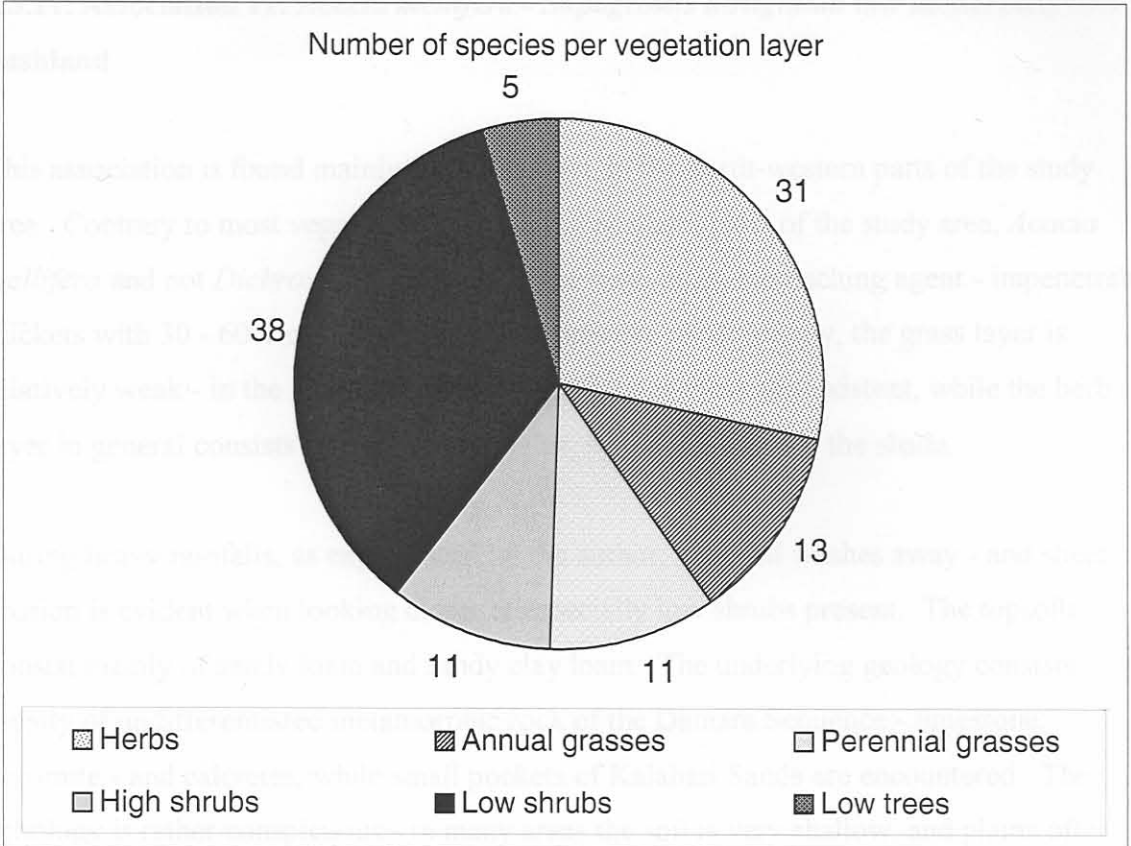


Figure 27a: Pie chart showing total number of species recorded for each vegetation layer in association 10.

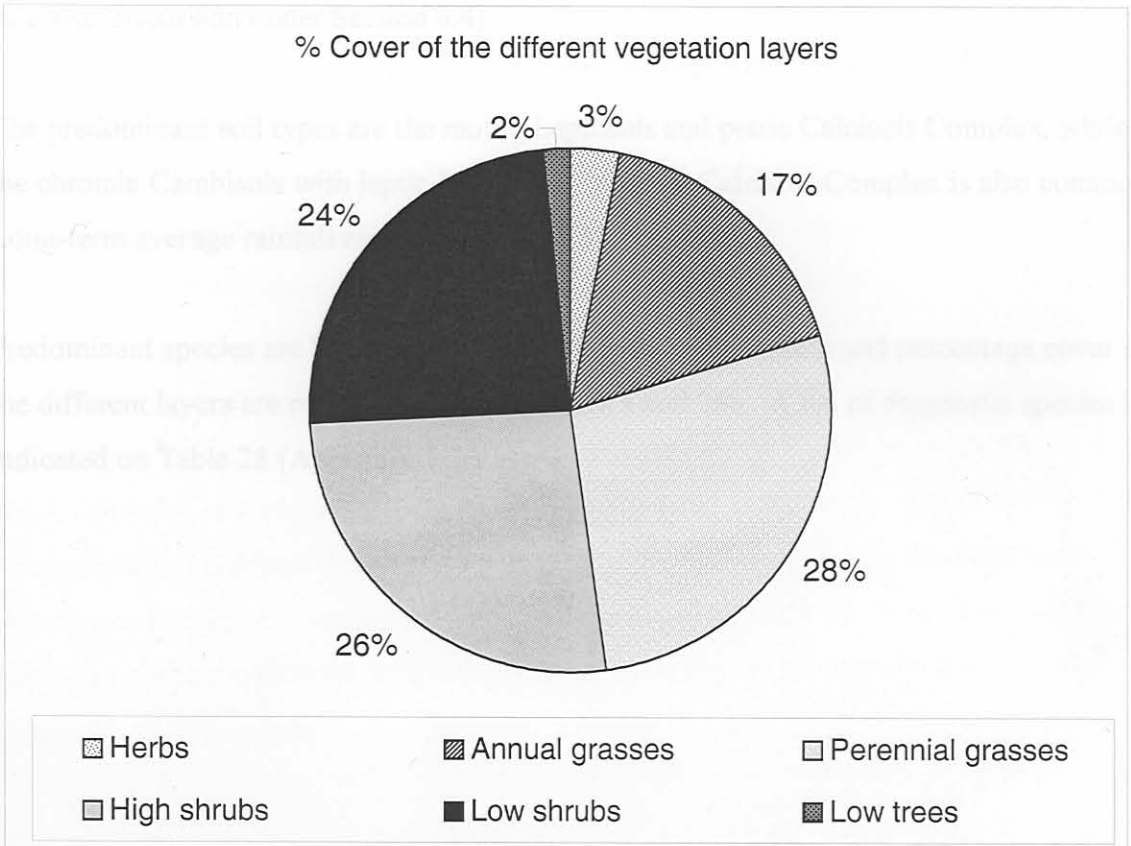


Figure 27b: Pie chart showing the average percentage cover each layer contributes to the total vegetation cover of association 10.

9.3.11. Association 11: *Acacia mellifera* - *Stipagrostis hirtigluma* low moderately closed bushland

This association is found mainly towards Otavi, in the north-western parts of the study area. Contrary to most vegetation found in the northern parts of the study area, *Acacia mellifera* and not *Dichrostachys cinerea* is the main bush-encroaching agent - impenetrable thickets with 30 - 60% cover are relatively common. Accordingly, the grass layer is relatively weak - in the most severely affected areas almost non-existent, while the herb layer in general consists of sparse individulas, which can tolerate the shade.

During heavy rainfalls, as experienced by the author, bare soil washes away - and sheet erosion is evident when looking closer at especially low shrubs present. The topsoils consist mainly of sandy loam and sandy clay loam. The underlying geology consists mostly of undifferentiated metamorphic rock of the Damara Sequence - limestone, dolomite - and calcretes, while small pockets of Kalahari Sands are encountered. The lithology is rather conspicuous - in many areas the soil is very shallow, and plains often consist of a large portion of flat bedrock or large stones, explaining it's tendency to degrade (see also discussion under Section 9.4)

The predominant soil types are the mollic Leptosols and petric Calcisols Complex, while the chromic Cambisols with leptic Regosols and petric Calcisols Complex is also common. Long-term average rainfall ranges from 470 - 530 mm p.a.

Predominant species are listed in Table 17, while the composition and percentage cover of the different layers are represented in Figures 28 a and 28b. A list of diagnostic species is indicated on Table 28 (Appendix 1.2.).

Table 17: Abundance and cover percentages of predominant species of the *Acacia mellifera* - *Stipagrostis hirtigluma* vegetation association

Species	abundance (% of samples)	average % cover	layer
<i>Acacia mellifera</i>	100	29.8	high shrub
<i>Melhania virescens</i>	100	0.5	low shrub
<i>Stipagrostis hirtigluma</i>	92	5.8	perennial grass
<i>Acacia reficiens</i>	85	5.1	high shrub
<i>Eragrostis echinochloidea</i>	85	1.8	perennial grass
<i>Seddera suffruticosa</i>	82	0.2	low shrub
<i>Eragrostis trichophora</i>	75	1.1	perennial grass
<i>Cenchrus ciliaris</i>	71	1.9	perennial grass
<i>Eriocephalus pubescens</i>	71	1.2	low shrub
<i>Otoptera burchellii</i>	71	0.1	low shrub
<i>Catophractes alexandri</i>	67	2.8	high shrub
<i>Clerodendrum ternatum</i>	67	0.3	low shrub
<i>Dichrostachys cinerea</i>	64	2.3	high shrub
<i>Enneapogon scoparius</i>	64	1.5	perennial grass
<i>Leucas pechuellii</i>	64	0.3	low shrub
<i>Lantana angolensis</i>	64	0.1	low shrub
<i>Geigeria omativa</i>	64	0.1	herb
<i>Ptycholobium biflorum</i>	64	0.1	low shrub
<i>Ruellia sp. nova</i>	64	0.1	herb
<i>Fingerhutia africana</i>	60	0.2	perennial grass
<i>Phyllanthus maderaspatensis</i>	60	0.1	herb
<i>Becium filamentosum</i>	60	0.1	herb
Total nr of species recorded	181		
Average % cover per sample		75.3	

Other species with locally high cover % are: *Enneapogon cenchroides*, *E. desvauxii*, *Stipagrostis uniplumis*, *Grewia flava*, *Tarchonanthus camphoratus*, low shrubs of *Croton gratissimus*, *Hiernia angolensis*, *Monechma genistifolium* and *Petalidium engleranum*. *Petalidium* often forms localised dense patches, and may not be found again on the remainder of a farm. The same applies to *Aloe littoralis* - several to hundreds of individuals may be found within a very limited area on a farm only. Trees such as *Acacia erioloba* and *Peltophorum africanum* are general, although sparsely distributed.

In general there seemed to be a higher diversity of succulent plants in this vegetation type (see synoptic Table, Table 25, Appendix 1.1.), e.g. *Plectranthus neochilus*, *Aloe zebrina* and *A. littoralis*, an alien *Opuntia* sp., *Kalanchoe* spp and *Stapelia* spp. Farmers (personal communication) reported that the *Opuntia* sp. (called wild-fig, possibly *Opuntia ficus-indica* or close relative) occasionally reached troublesome densities. In such cases, farmers managed to obtain cochineal, which they report can bring the infestations under control within two to three years.

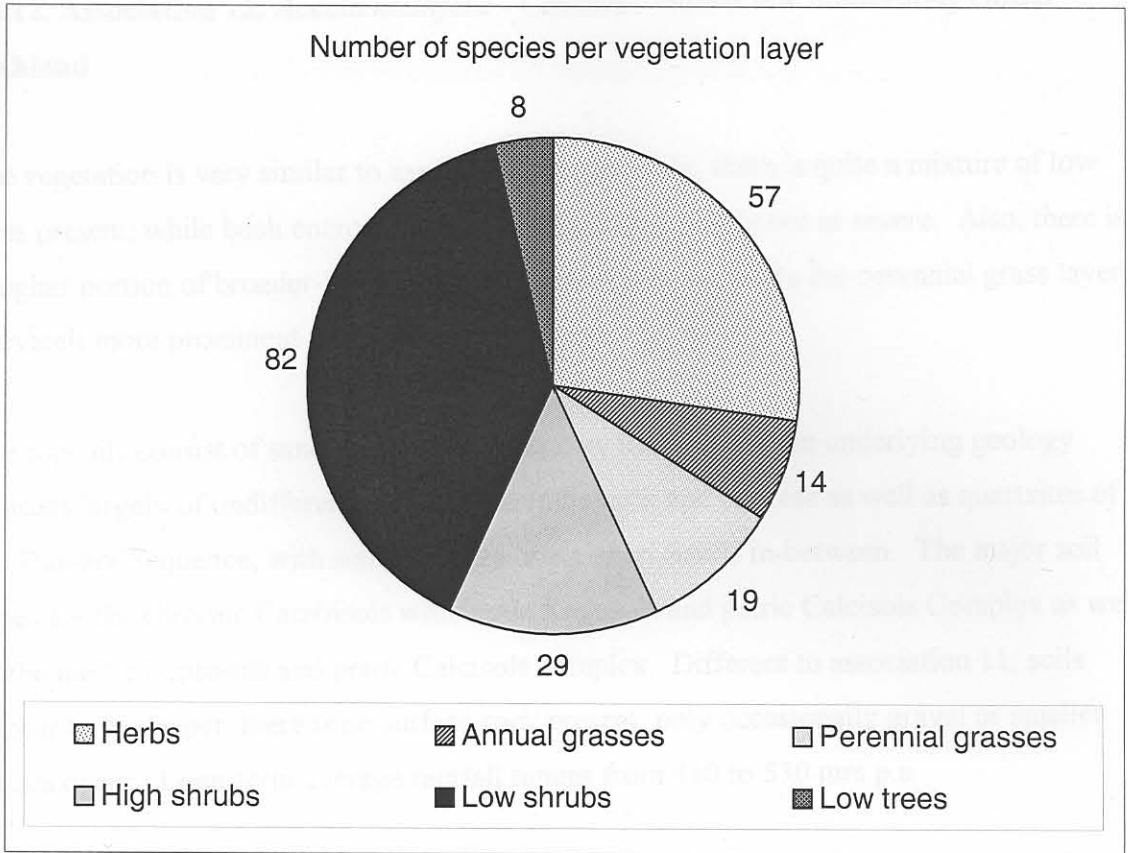


Figure 28a: Pie chart showing the total number of species recorded for each vegetation layer in association 11.

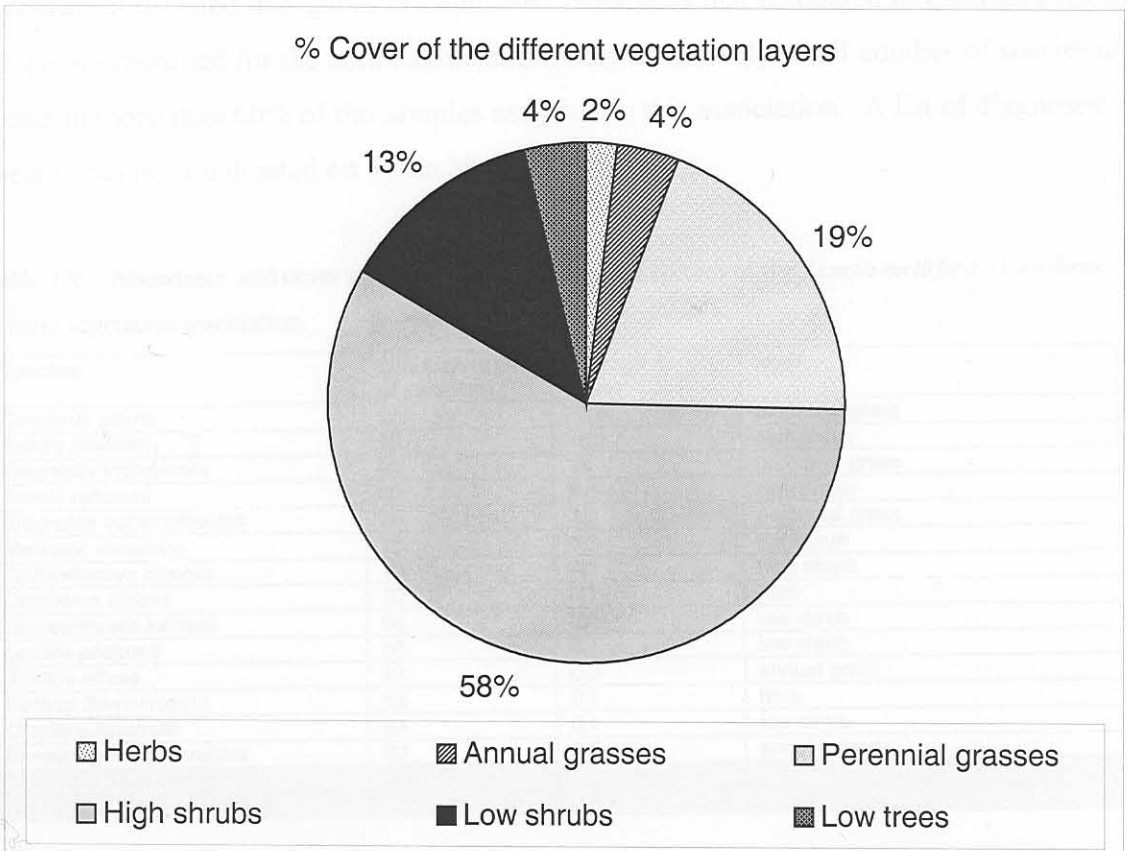


Figure 28b: Pie chart showing the average percentage cover each layer contributes to the total vegetation cover of association 11.

9.3.12. Association 12: *Acacia mellifera* - *Cenchrus ciliaris* low moderately closed bushland

The vegetation is very similar to association 11, however, there is quite a mixture of low trees present, while bush encroachment by *Acacia mellifera* is not as severe. Also, there is a higher portion of broader-leafed shrubs and trees present, while the perennial grass layer is overall more prominent than high shrubs.

The topsoils consist of sandy loam and sandy clay loam, while the underlying geology consists largely of undifferentiated metamorphic rock and calcrete as well as quartzites of the Damara Sequence, with small patches of Kalahari Sands in-between. The major soil types are the chromic Cambisols with leptic Regosols and petric Calcisols Complex as well as the mollic Leptosols and petric Calcisols complex. Different to association 11, soils appear to be deeper, there is no surface rock present, only occasionally gravel or smaller stones occur. Long-term average rainfall ranges from 410 to 530 mm p.a.

Predominant species are listed in Table 18, while composition and % cover of the different layers are illustrated in Figures 29a and 29b. Notable is that compared to the high number of species recorded for the entire association, only a relatively small number of species are found in more than 60% of the samples assigned to this association. A list of diagnostic species has been indicated on Table 28 (Appendix 1.2.).

Table 18: Abundance and cover percentages of predominant species of the *Acacia mellifera* - *Cenchrus ciliaris* vegetation association

Species	abundance (% of samples)	average % cover	layer
<i>Cenchrus ciliaris</i>	96	12.8	perennial grass
<i>Acacia mellifera</i>	93	15.1	high shrub
<i>Eragrostis trichophora</i>	90	11	perennial grass
<i>Acacia reficiens</i>	90	8.4	high shrub
<i>Eragrostis echinochloidea</i>	86	3.2	perennial grass
<i>Melhania virescens</i>	76	0.3	low shrub
<i>Dichrostachys cinerea</i>	70	4.3	high shrub
<i>Corchorus tridens</i>	70	0.1	herb
<i>Leucosphaera bainesii</i>	66	0.5	low shrub
<i>Leucas pechuelii</i>	66	0.1	low shrub
<i>Aristida effusa</i>	63	0.3	annual grass
<i>Becium filamentosum</i>	63	0.1	herb
<i>Ooptera burchellii</i>	63	0.1	low shrub
<i>Enneapogon cenchroides</i>	60	0.5	annual grass
Total nr of species recorded	283		
Average % cover per sample		84.3	

A very conspicuous element in this association is the generally high cover of *Cenchrus ciliaris* - reaching cover percentages of 45 %, especially where farmers have put much effort into de-bushing the area.

Other species with locally high percentage cover include *Enneapogon scoparius*, *Stipagrostis hirtigluma*, *Stipagrostis uniplumis* and *Monechma genistifolium*, with high shrubs and trees of *Acacia tortilis*. Occasionally small groups of *Acacia erioloba*, *Combretum imberbe* and *Lonchocarpus nelsii* as well as single trees of *Albizia anthelmintica* and *Boscia albitrunca* can be found.

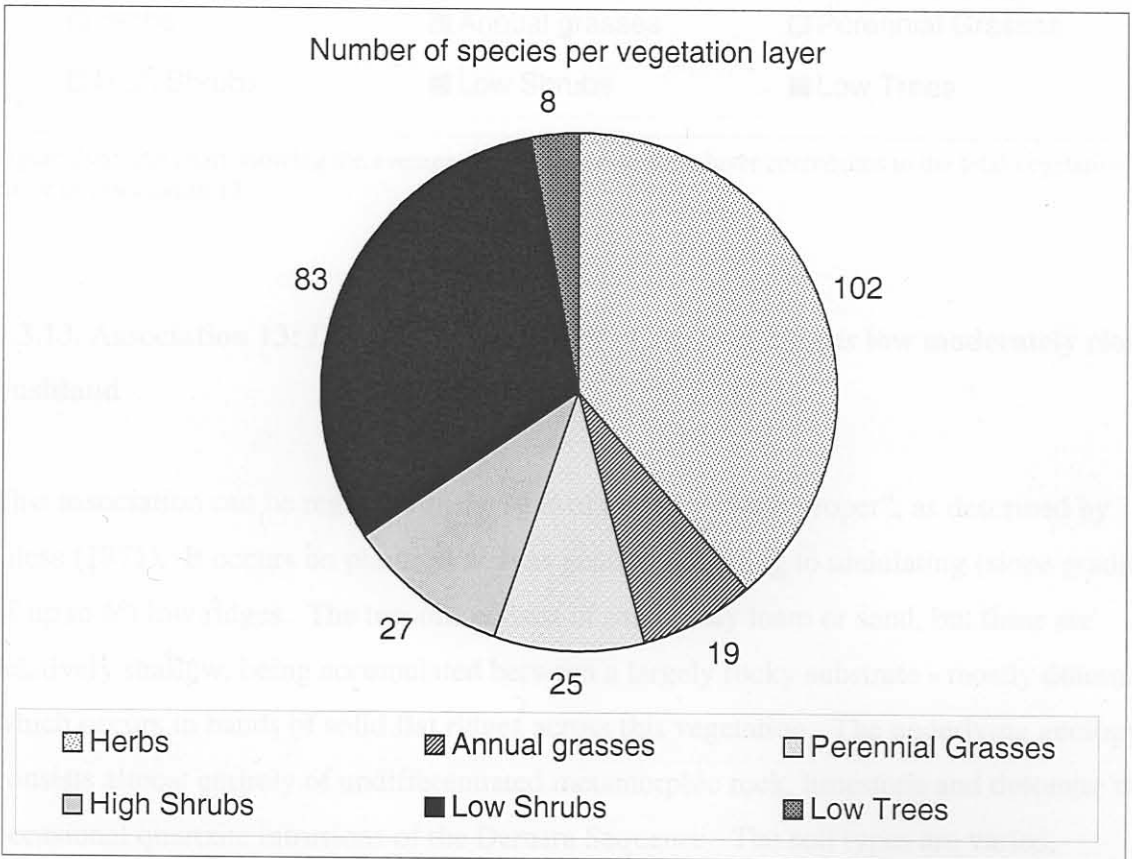


Figure 29a: Pie chart showing the total number of species recorded for each vegetation layer in association 12.

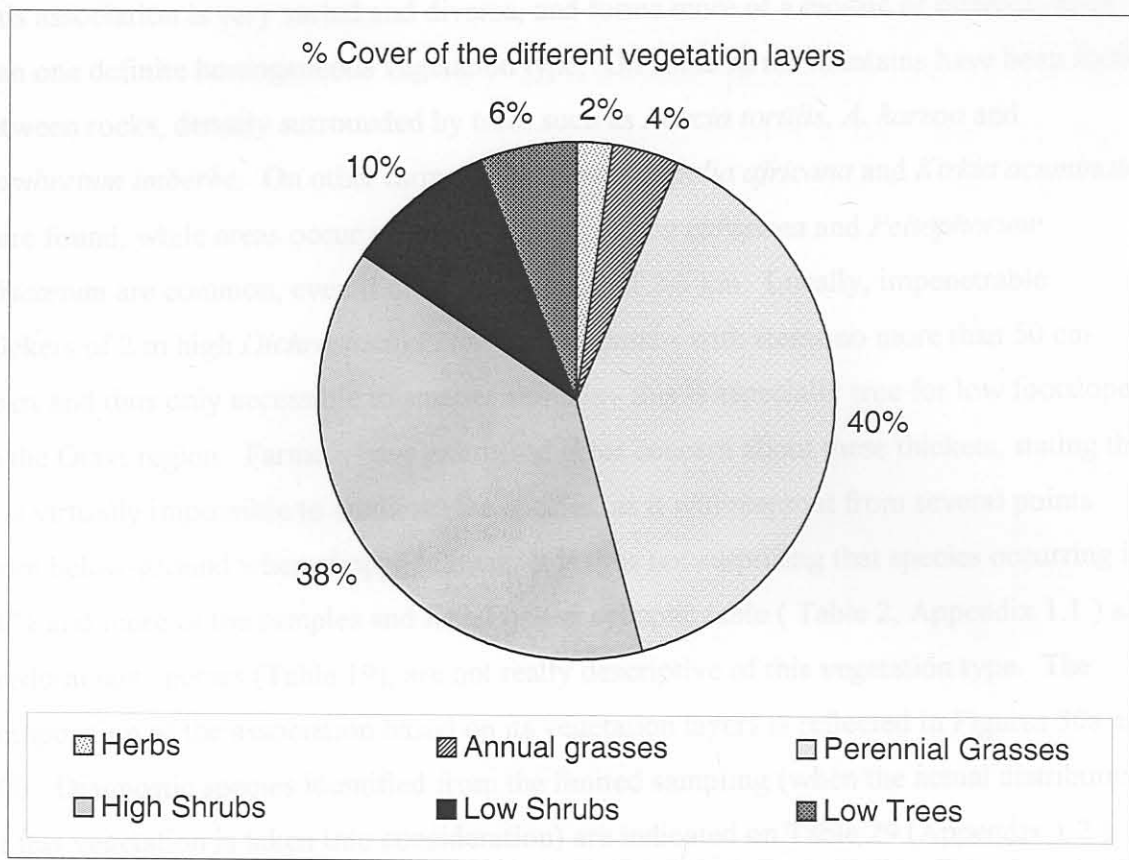


Figure 29b: Pie chart showing the average percentage cover each layer contributes to the total vegetation cover of association 12.

9.3.13. Association 13: *Dichrostachys cinerea* - *Cenchrus ciliaris* low moderately closed bushland

This association can be regarded as the start of the “Karstveld proper”, as described by Giess (1971). It occurs on plains as well as gently undulating to undulating (slope gradient of up to 6°) low ridges. The topsoils consist of sandy clay loam or sand, but these are relatively shallow, being accumulated between a largely rocky substrate - mostly dolomite, which occurs in bands of solid flat ridges across this vegetation. The underlying geology consists almost entirely of undifferentiated metamorphic rock, limestone and dolomite with occasional quartzite intrusions of the Damara Sequence. The soil types are varied, including especially the chromic Cambisols with leptic Regosols and petric Calcisols Complex, leptic Regosols as well as the mollic Leptosols and petric Calcisols Complex. Long-term average rainfall ranges from 420 - 560 mm p.a.

This association is very varied and diverse, and forms more of a mosaic of different units than one definite homogeneous vegetation type. On some farms fountains have been found between rocks, densely surrounded by trees such as *Acacia tortilis*, *A. karroo* and *Combretum imberbe*. On other farms large trees of *Kigelia africana* and *Kirkia acuminata* were found, while areas occur where low trees of *Olea europaea* and *Peltophorum africanum* are common, even if only for a stretch of 2-5 km. Locally, impenetrable thickets of 2 m high *Dichrostachys cinerea* are found - with stems no more than 50 cm apart and thus only accessible to smaller animals - this is especially true for low footslopes in the Otavi region. Farmers have expressed great concern about these thickets, stating that it is virtually impossible to eradicate the species, as it will resprout from several points from below-ground when chopped down. It is thus not surprising that species occurring in 60% and more of the samples and listed on the synoptic table (Table 2, Appendix 1.1.) as predominant species (Table 19), are not really descriptive of this vegetation type. The composition of the association based on its vegetation layers is reflected in Figures 30a and 30b. Diagnostic species identified from the limited sampling (when the actual distribution of this vegetation is taken into consideration) are indicated on Table 29 (Appendix 1.2.).

Table 19: Abundance and cover percentages of predominant species of the *Dichrostachys cinerea* - *Cenchrus ciliaris* vegetation association

Species	abundance (% of samples)	average % cover	layer
<i>Cenchrus ciliaris</i>	94	3.8	perennial grass
<i>Acacia mellifera</i>	91	8.7	high shrub
<i>Dichrostachys cinerea</i>	82	9.7	high shrub
<i>Melhania virescens</i>	82	0.6	low shrub
<i>Eragrostis echinochloidea</i>	77	1.6	perennial grass
<i>Grewia flavescens</i> var. <i>flavescens</i>	74	1.1	high shrub
<i>Melinis repens</i> ssp. <i>grandiflora</i>	74	0.9	annual grass
<i>Enneapogon cenchroides</i>	74	0.7	annual grass
<i>Becium filamentosum</i>	71	0.1	herb
<i>Eragrostis trichophora</i>	65	2.6	perennial grass
<i>Evolvulus alsinoides</i>	65	0.1	herb
<i>Acacia reficiens</i>	62	3.1	high shrub
<i>Tragus berteronianus</i>	62	0.1	annual grass
<i>Lantana angolensis</i>	62	0.1	low shrub
<i>Urochloa brachyura</i>	60	0.9	annual grass
<i>Aristida effusa</i>	60	0.2	annual grass
Total nr of species recorded	260		
Average % cover per sample		68.25	

Other species with high cover percentages include *Eragrostis porosa*, *Digitaria seriata*, *Heteropogon contortus*, *Stipagrostis uniplumis*, *Urochloa oligotricha*, *Aptosimum decumbens*, *Craterostigma plantagineum* and *Xerophyta humilis* (very high cover, but very

localised). Typical, but localised shrubs and low trees include *Acacia ataxacantha*, *A. fleckii*, *A. karroo*, *A. tortilis*, *Aloe littoralis* (very small patches with 10 to hundreds of individuals), *Catophractes alexandri*, *Combretum apiculatum*, *C. hereroense*, *C. imberbe*, *Croton gratissimus* (here mostly high shrubs), *Grewia bicolor*, *Tarchonanthus camphoratus* and *Terminalia prunioides*.

Species commonly present include: *Brachiaria deflexa*, *Aristida effusa*, *Eragrostis nindensis*, *Limeum sulcatum*, *Ocimum americanum*, *Phyllanthus pentandrus*, *Rhynchosia* spp, *Solanum* spp, *Commiphora* spp, *Euclea undulata*, *Petalidium engleranum*, *Ozoroa paniculosa*, *Hiernia angolensis*, *Tinnea rhodesiana* and *Maytenus senegalensis*.

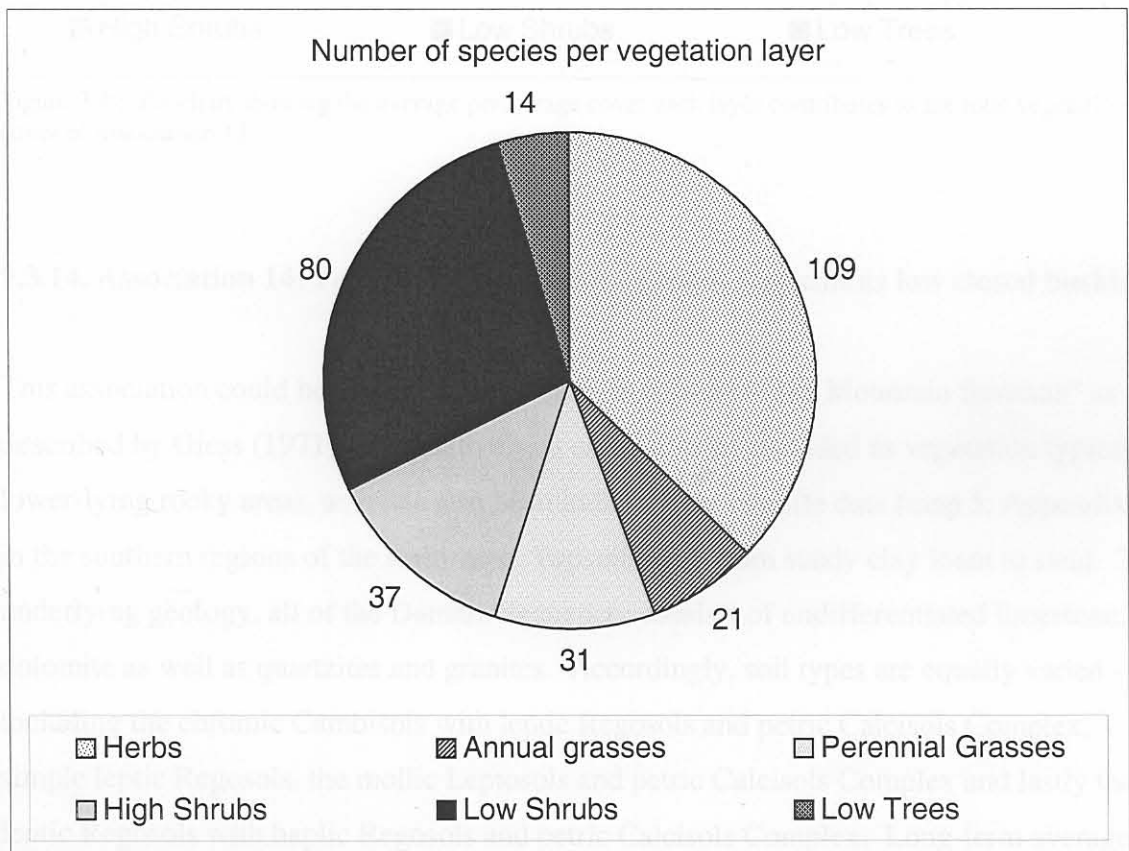


Figure 30a: Pie chart showing the total number of species recorded for each vegetation layer in association 13.

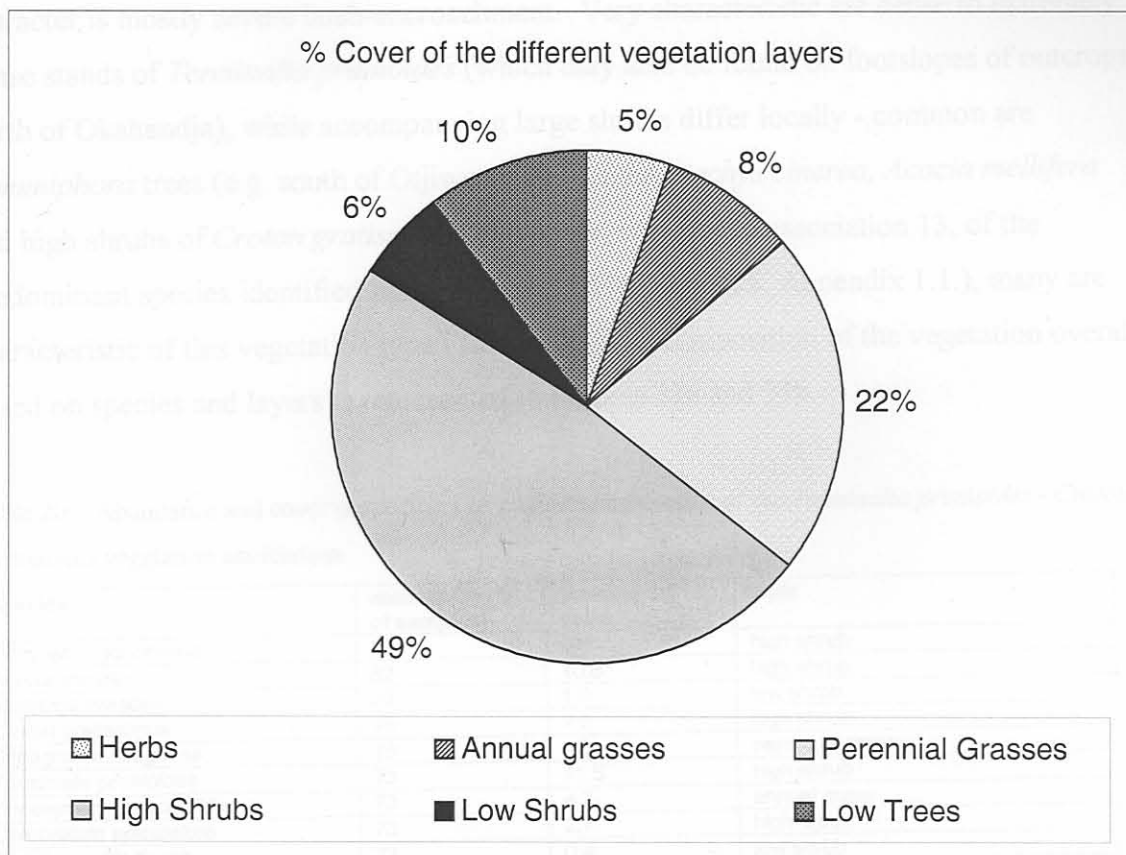


Figure 30b: Pie chart showing the average percentage cover each layer contributes to the total vegetation cover of association 13.

9.3.14. Association 14: *Terminalia prunioides* - *Croton gratissimus* low closed bushland

This association could be classified as the “lower outliers of the Mountain Savanna” as described by Giess (1971). Alternatively, it could also be regarded as vegetation typical of lower-lying rocky areas, as it has also been indicated by satellite data (map 5, Appendix 4) in the southern regions of the study area. Topsoils vary from sandy clay loam to sand. The underlying geology, all of the Damara Sequence, consists of undifferentiated limestone, dolomite as well as quartzites and granites. Accordingly, soil types are equally varied - including the chromic Cambisols with leptic Regosols and petric Calcisols Complex, simple leptic Regosols, the mollic Leptosols and petric Calcisols Complex and lastly the leptic Regosols with haplic Regosols and petric Calcisols Complex. Long-term average rainfall ranges from 420 - 560 mm p.a.

Considering the varied geology and soils, it is not surprising that similar to association 13, this vegetation consist of a number of varying units in a mosaic. One unfortunate unifying

character is mostly severe bush-encroachment. Very characteristic are dense to extremely dense stands of *Terminalia prunioides* (which may also be found on footslopes of outcrops north of Okahandja), while accompanying large shrubs differ locally - common are *Commiphora* trees (e.g. south of Otjiwarongo), *Dichrostachys cinerea*, *Acacia mellifera* and high shrubs of *Croton gratissimus*. However, contrary to association 13, of the predominant species identified in the synoptic table (Table 25, Appendix 1.1.), many are characteristic of this vegetation type (Table 20). The composition of the vegetation overall based on species and layers is represented in Figures 31a and 31b.

Table 20: Abundance and cover percentages of predominant species of the *Terminalia prunioides* - *Croton gratissimus* vegetation association

Species	abundance (% of samples)	average % cover	layer
<i>Dichrostachys cinerea</i>	95	8.5	high shrub
<i>Acacia mellifera</i>	82	10.8	high shrub
<i>Melhania virescens</i>	82	1.0	low shrub
<i>Croton gratissimus</i>	78	7.2	high shrub
<i>Stipagrostis hirtigluma</i>	78	4.3	perennial grass
<i>Terminalia prunioides</i>	73	11.5	high shrub
<i>Enneapogon cenchroides</i>	73	4.3	annual grass
<i>Combretum apiculatum</i>	73	2.1	high shrub
<i>Seddera suffruticosa</i>	73	0.4	low shrub
<i>Acacia reficiens</i>	69	3.9	low tree
<i>Eragrostis echinochloidea</i>	69	2.5	perennial grass
<i>Melinis repens ssp. grandiflora</i>	69	1.2	annual grass
<i>Rhus marlothii</i>	69	0.5	high shrub
<i>Aristida effusa</i>	65	1.5	annual grass
<i>Catophractes alexandri</i>	60	2.8	high shrub
<i>Heteropogon contortus</i>	60	1.2	perennial grass
Total nr of species recorded	170		
Average % cover per sample		95.7	

Other species with occasionally high cover include: *Aristida adscensionis*, *A. effusa*, *Eragrostis porosa*, *Cenchrus ciliaris*, *Enneapogon desvauxii*, *E. scoparius*, *Eragrostis nindensis*, *Hypoestes forskalii*, *Combretum hereroense*, *C. imberbe*, *Grewia flava*, *G. flavescens* var. *flavescens*, *Commiphora tenuipetiolata* and *Peltoporum africanum*. Grass species in particular vary significantly from farm to farm (see further discussion under Section 9.4).

Further typical species include *Commiphora* spp, *Dombeya rotundifolia*, *Euclea undulata*, *Hibiscus caesius*, *Otoptera burchellii*, while single large trees of *Ozoroa insignis* and *Lannea discolor* can be found. Further up the slopes south-east of Otavi, but not considered part of the survey, are several large trees of *Sclerocarya birrea*.

Figure 31b: Pie chart showing the average percentage cover with layer contribution to the vegetation association 14.

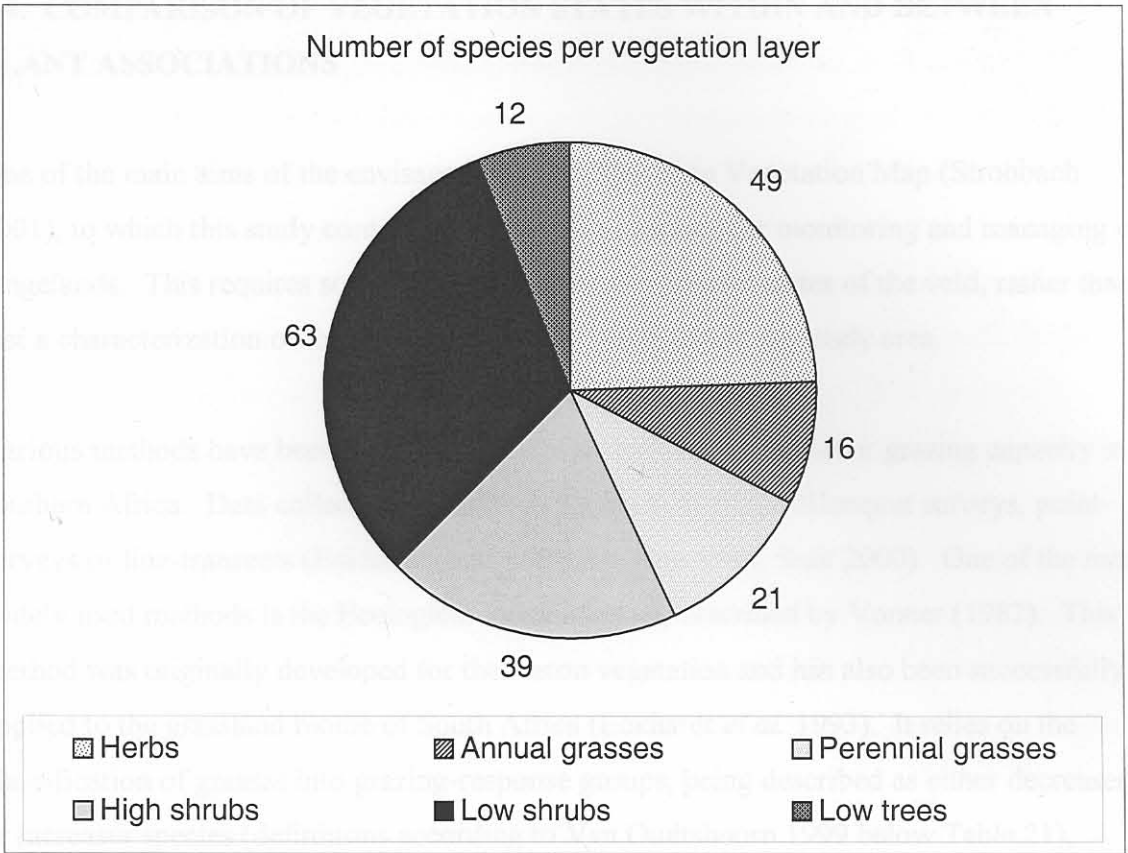


Figure 31a: Pie chart showing total number of species recorded for each vegetation layer in association 14.

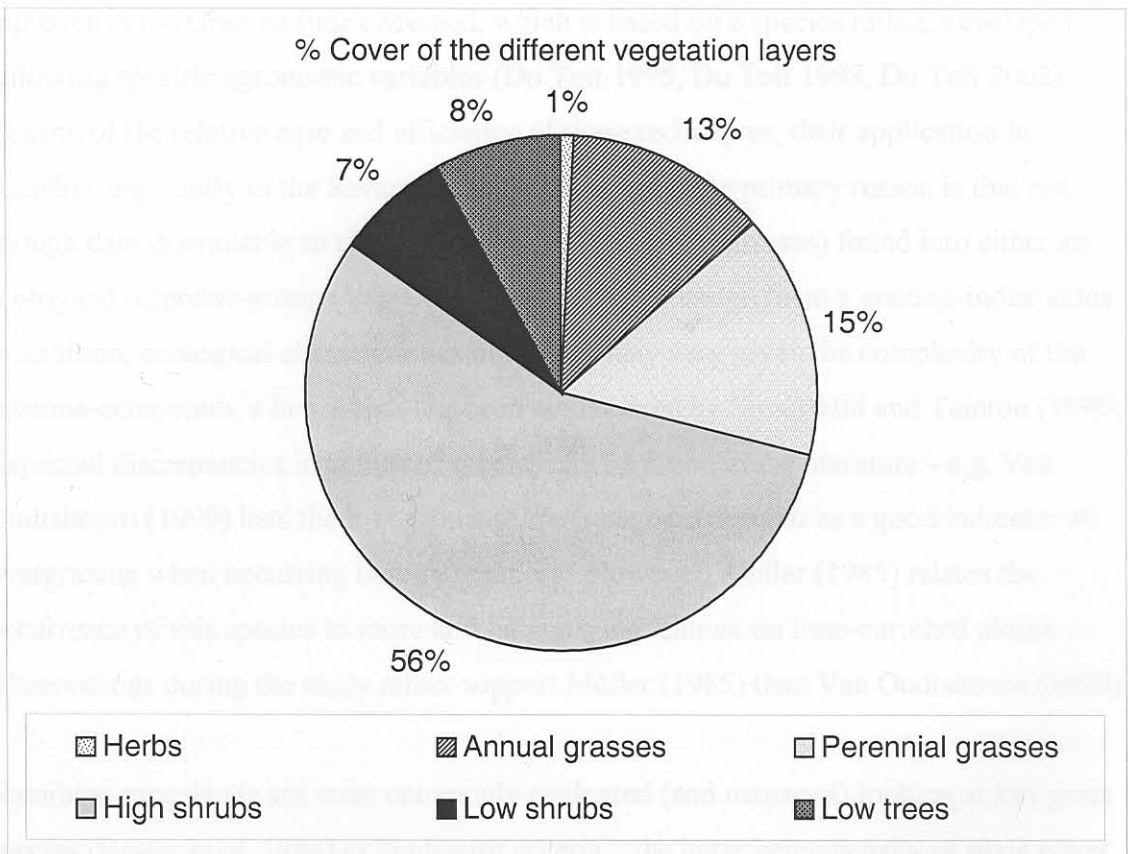


Figure 31b: Pie chart showing the average percentage cover each layer contributes to the total vegetation cover of association 14.