Chapter 2: **Land and Transformation** for the Limpopo Province, South Africa
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**Acronyms**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Centigrade</td>
</tr>
<tr>
<td>CAPP</td>
<td>Central Appalachian Price</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>Ha</td>
<td>Hectare</td>
</tr>
<tr>
<td>IFPRI</td>
<td>International Food Policy Research Institute</td>
</tr>
<tr>
<td>LDA</td>
<td>Limpopo Department of Agriculture</td>
</tr>
<tr>
<td>LSU</td>
<td>Large Stock Unit</td>
</tr>
<tr>
<td>NDA</td>
<td>National Department of Agriculture</td>
</tr>
<tr>
<td>PGM</td>
<td>Platinum Group Metals</td>
</tr>
<tr>
<td>SAHGCA</td>
<td>South African Hunters and Game Conservation Association</td>
</tr>
<tr>
<td>StatsSA</td>
<td>Statistics South Africa</td>
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</tbody>
</table>
1. Introduction

The Limpopo Province is the 5th largest province of South Africa (similar in size to the Free State and Western Cape Provinces) contributing 10.6 percent (%) of the country’s total land area.

![Figure 1: Provincial Land Area Comparison](source: Statistics SA)

Land is the basis for many life support systems, from production of biomass that provides food, fodder, fibre, and fuel for human use, to being an essential natural resource in other respects, providing for functions such as:

- the provision of biological habitats and gene reserves for plants, animals and micro-organisms;
- a climate regulative function;
- a storehouse of raw materials and minerals for human use;
- a regulation of water quality and quantity (flow and storage);
- a waste and pollution control function through the receiving, filtering and transformation of hazardous compounds;
- a space provision for the transport of people, inputs and produce (and for the movement of plants and animals between natural ecosystems);
- the provision of a physical basis for human settlements and industry; and
- a medium for storage and protection of cultural history of humankind.
The Province has two overriding features of land usage. The 1st feature is the diverse agricultural profile of the Province due to 3 distinct climatic regions. These are the arid Lowveld region, the semi-arid Middleveld and Highveld region, and lastly the Escarpment region, which has a sub-humid climate with rainfall in excess of 700mm per annum. Such a climate variation allows Limpopo to produce a diversity of agricultural outputs, ranging from extensive cattle and game farms to intensive horticultural production, such as cut flowers.

The 2nd main feature is that agriculture accounts for 90% (11.3 million ha) of the Province’s 12.6 million ha land area. On this land, 2,900 commercial farmers using 68% of area, with 300,000 small farmers farming the balance. The small farmers (largely subsistence production under communal tenure land) tend to operate on a low input/low output basis, whereas the commercial farms represent a higher level of capital investment and technology usage, with corresponding greater farm productivity. This differentiation is an important one and will be discussed further in this chapter.

2014 satellite remote sensing indicates the following Provincial land coverage, where 3 categories (woodlands/open bush, grasslands and thicket/dense bush) account for 79% of land cover. This area plus low shrub land accounts for Limpopo grazing usage (therefore grazing accounts for 81% of land cover or 10.2 million ha).

In contrast, total cropping coverage in 2014 was only 1.3 million ha or 10.5% of total area (of which 30% was subsistence cropping).
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Other larger land cover areas included a concerning 470,000 ha of bare, with an additional degraded ground accounting for 3.8% of total area). There were also 47,000 ha of wetland and 46,000 ha of indigenous forest.

2. Drivers, Pressures and State

2.1 Agriculture

Land use (existing and potential) on communal and commercial agricultural land is detailed in Table 2.

<table>
<thead>
<tr>
<th>Total area</th>
<th>Farmland</th>
<th>Arable land</th>
<th>Arable used</th>
<th>Grazing land</th>
<th>Nature cons.</th>
<th>Forestry</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
<td>ha</td>
</tr>
<tr>
<td>Limpopo Province Total</td>
<td>11960600</td>
<td>10548290</td>
<td>1700442</td>
<td>*</td>
<td>8847848</td>
<td>1161600</td>
<td>65410</td>
</tr>
<tr>
<td>Communal areas</td>
<td>3612400</td>
<td>3394518</td>
<td>530700</td>
<td>*</td>
<td>2863818</td>
<td>127200</td>
<td>6060</td>
</tr>
<tr>
<td>Commercial farms</td>
<td>8348200</td>
<td>7153772</td>
<td>1169742</td>
<td>660090</td>
<td>5984030</td>
<td>1034400</td>
<td>59350</td>
</tr>
</tbody>
</table>

Source: NDA Abstract of Agricultural Statistics 2013

The Limpopo Department of Agriculture, using a combination of remote sensing and field surveys, reported a higher total farm land area of 11,321,098 ha in 2012. Although specific areas differ slightly, the point to note is that 99% of farmers (300,000 small farmers) farm on not much more than 30% of land. Undoubtedly there will be continued and increased socio-political pressure to address this fact in the shorter term.

The Limpopo Province has always been considered as a Province known for high-value horticultural production and this is reflected in the value of Provincial output by type of produce. Figure 3 shows the value of agricultural types for 2002 and 2007.

![Figure 3: Value of Gross Income per Agriculture Type (R’000) 2002 and 2007.](image-url)
While the value of horticultural output remains high and important, it is livestock production that has shown the most spectacular increase, undoubtedly due to game farming coming into greater prominence.

In 1993, Stats SA data shows that 21% of Limpopo farms were mainly horticultural, but since then no data is available to indicate whether this still holds true. Since 1993, the total number of commercial farms has decreased from 5,053 to 2,934 farms, most likely due to a combination factors including decreasing farm economics, land restitution and the farm security situation. Such a decrease in the number of commercial farms and resultant increase in farm size, is a general national feature in the sector.

**Cropping**

Figure 5 displays the broad width of Limpopo’s suite of farm enterprise, but in reality it’s the production of 11 commodities that account for 87% of cropped area.

Of these, Macadamias, Avocado, Mangoes, Citrus and even Lucerne are essentially capital intensive crops where production only reaches full output in differing annual periods after the establishment year. These commodities are therefore relatively capital intensive and with economic uncertainty and low confidence in the commercial farm sector, no sector expansion from these ‘longer-term’ enterprises is expected.
Wheat (produced in winter) is essentially an irrigated crop, and mainly grown in a rotation of summer crops where the second crop is essential for economic returns on high irrigation capital costs. With the currently weak economic outlook nationally, which is likely to see upward pressure on interest rates, plus low commercial farming confidence and tighter irrigation administration, will likely contain the expansion of irrigation.

The maize area, particularly dryland maize, is however likely to remain very buoyant. South Africa is presently being forced to import maize due to low production results for the 2015 harvest. Furthermore, the current extremely serious drought conditions in the country exacerbate the situation, until the current season changes. The 2015 local price of white maize has risen by 27% and that of yellow maize, used mainly as animal feed, by 13%. As food comprises 14% of SA’s inflation basket (Stats SA) and maize and products related to the grain, such as chickens, dairy and beef, contribute 74% of that, this price hike will have a significant knock-on effect on foodstuff inflation. In turn this will affect low-income rural households, which is of relevance to the majority of the population in Limpopo. 62% of Limpopo’s maize area is already attributed to small farmers, and it is these rural households that would feel the economic pressure more than others. This could
substantially force small farmers to increase maize production for food security purposes, and possibly in areas that are not suitable for maize production (e.g. where rainfall is less than 450mm).

Some 95% of emergent small farmer production takes place within the communal tenure system. There is evidence that the area cropped has decreased from 466,128 ha in 1990 to 403,926 ha in 2014, showing a 13% reduction. Theoretically the arable area potential in communal tenure areas is already 76% met (including 62% of the Limpopo maize area), yet with the current economic downswing in the country, severe Limpopo unemployment challenges and an escalating population, one could expect this area of cropping to expand, primarily for survival. Such expansion will place additional environmental pressures on an already significantly transformed area.

Figure 6: Spatial Distribution of Maize Production.

Source: LDA (The Mapping of Agricultural Commodity Production 2013)
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Sunflower production is likely to remain buoyant particularly in the context of its short production cycle and lower rainfall requirements. Tomatoes will be another irrigation-dependent crop and also reliant on market development and access, and therefore are unlikely to change significantly.

Potato prices are softer and will likely remain such, well into 2016. Potatoes are therefore unlikely to pressurise Limpopo cropping expansion in the short to medium term.

From an overall cropping area viewpoint, indications are that of the potentially arable commercial land (116,9742 ha), arable area usage (including woodlots and plantations) has remained fairly constant and actually shrunk by 5% during the last 14 years to 923 000ha. Sitting at close to 80% of arable potential, this shows that only lesser productive land is still available. This together with the multiple uncertainties currently facing SA commercial farming, like climate change and a provincial irrigation system under strain, indicate that cropping is unlikely to expand significantly. Its composition will depend on price outlooks for field crop commodities and how those commodities fit into a crop rotation. Maize is likely to be an exception, for reasons explained.

Regarding increasingly scarce water resources, conservation concern is sometimes expressed over agriculture accounting for 60-70% of total Provincial water consumption, yet only contributing some 3% to GDP. Of course agriculture’s importance shouldn’t only be based on GDP share alone, but should be regarded in the broader context; food security and employment being 2 such examples.

**Livestock**

Livestock numbers for the Province are depicted in Figure 7 and show that the cattle population has decreased over the last 20 years to an apparent constant level of just over 1 million head since 2008, despite beef cattle being a traditional pillar of agriculture in Limpopo.

![Figure 7: Livestock numbers 1996-2012 (head)](source: NDA National Livestock Statistics Newsletter)
The Province is under grazing pressure, mainly within the distribution of communal rangelands, and specifically in the steeply sloping areas adjacent to the escarpment. However commercial herd decrease since the first half of the 90’s might be a reflection of a significant swing that has taken place since 1994 in the national red meat production sector where some 85% of beef in South Africa is now feedlot finished. Not being a leading maize supplier, Limpopo might have become more of a supplier of feedlot material, rather than a supplier of grass-finished beef, since feedlot economics favour the transport of animals to maize supplies rather than the expensive cost of bringing grain in. Added to that is the reported spectacular growth in game farming by organisations such as the South African Hunters and Game Conservation Association. Although statistics are difficult to come by, it is noted that game would have to compete with livestock for grass resources.

The split between small farmers and large commercial ownership of cattle is unknown, but the indications are (StatsSA, 2011) that 20% of rural households owned cattle and that 75% of these households had small herds of 1-10 head. Similarly, 24% of cattle-owning households recorded herds of 11-100 in size.

These figures imply that a high proportion of cattle ownership and grazing takes place in areas of communal land tenure – a figure that could be as high as 40% of total cattle owned. This contention is further borne out by the following map which depicts Provincial land areas used for cattle production.

Figure 8: Areas of Limpopo Beef Production
What is also of particular concern is the significant increase in the Provincial goat population in the years 2000 and 2008. If unmanaged, goats can have a notoriously negative environmental impact through the short to medium term transformation of grazing biomes. 17% of rural households own goats (StatsSA 2011), of which 75% own flocks of 1-10. Most of the goats are situated within the communal grazing areas of the Province.

Unlike commercial livestock production which is managed by a profit motive, the majority of smallholder livestock is held under a different production system – a complex socio-economic one that largely reflects societal needs. In addition, communal herds and flocks grazing on communal land present a difficult resource protection situation, due to socio-cultural pressures. From an environmental standpoint, the communal grazing areas are thus severely pressurised, with land degradation restricting productive and regenerative capacity. Increases in pressures include increased stock numbers, population increase and climate change, all lead to further environmental degradation.
Game Farming

Game farming has shown a spectacular increase within Limpopo over the last two decades although official statistics are difficult to obtain. It is reported that 50% of South Africa’s 9,000 game farms are situated in Limpopo and about 80% of the hunting in South Africa takes place in the Province (Eloff, 2002). Reasons for this are political stability, species availability (Lindsey, 2008; Van der Merwe et al., 2011) and ease of access from Gauteng (Warren, 2011).

In 2010, hunters spent an estimated total of R1.5 billion on licences & permits, travel, supplies and services directly connected to hunting in Limpopo (van der Merwe et al, 2014). That value approximately equates to the total value of Limpopo agriculture a decade previously.

“.... in 2006/2007 each foreign leisure hunter spent about R122000. This was roughly 14 times more than that spent by the average foreign tourist arriving in SA by air”.

Dr Herman Els, SAHGCA

2.2 Climate Change

Climate change research in South Africa indicates that the region encompassing Limpopo stands to possibly face temperature changes by up to 2°C by 2035. At the same time, there is less certainty over rainfall as some models predict increases but others decreases. It is however predicted that effective rainfall will be reduced due to higher evaporation rates. One can therefore expect the patterns of land use in the Limpopo Province to be affected and alter accordingly over time. In this
context Limpopo is one of South Africa’s most sensitive provinces in terms of the susceptibility of the agriculture sector due to climate change. The International Food Policy Research Institute justifiably based this on the high proportion and economic importance of the Provincial smallholder farmer sector.

Climate change has the potential to affect both the spatial patterns of land use and its intensity of use. A changing ability of the landscape to support productive use would consequently affect the distribution of people over time.

2.3 Population and Socio-economic Situation

Humanity has a direct effect on the environmental landscape it finds itself in. Human activities can transform sustainability of water supply, land formation, soil, vegetation, vegetation and general biodiversity. The spatial distribution of population and its density is therefore a primary driver of land function and form in the Limpopo Province.

The Limpopo Province had a population density of 43.5 people per km$^2$ and supported a total population of 5,506,633 in 2014 (IHS Global Insight). There are vast differences in district population densities, ranging from 14.4 in Waterberg to Sekhukhune’s far higher 80.3 people per km$^2$. Densities tend to differentiate because of different urban centres, employment opportunities generated, land tenure and general natural resource capacity. Over time there is a natural increase in population density due to population growth, but changes can also happen due to the economic situation and natural resource depletion. In turn, population density changes can also affect the character and distribution of agricultural land.

The rate of change in Limpopo population density is shown in the Figure 11.

Figure 11: Changes in Limpopo Population Density 1996-2013 (people/km$^2$)

Source: IHS Global Insight

Not only population numbers and density affect the rate of land transformation, for social and
economic factors such as residential density, population age profiles, socio-economic welfare and cultural affiliation can have an individual or collective effect.

2.4 Mining

Most provinces have a dominant sector that provides the largest share of their economic output. Just as the financial services sector makes up over 25% of the Western Cape’s economy and supports a similar figure for Gauteng, it is mining that provides the leading role in Limpopo’s economy, with a contribution that exceeds 28% of the Provincial GDP.

Figure 12: Mining Sector Contribution to GDP 2003-2012

Limpopo is truly well-endowed with a wide variety of minerals and can boast of the largest diamond and copper mines in South Africa, the biggest open-pit platinum mine in the country and the biggest vermiculite mine in the world. Currently, there are 78 operating mines in the Province, with an additional 91 mines being planned for the near future and approximately 400 prospecting and mining licences having being granted.

Furthermore, the Province has 41% of South Africa’s platinum group metals (PGMs), 90% of South Africa’s red-granite resources and approximately 50% of the country’s coal reserves. Antimony, a highly strategic mineral found in large quantities in China, is another of Limpopo’s major assets. However, the larger mining operations in the Province include diamonds, coal and platinum group metals deposits which, between them, account for some 80% of Limpopo mineral revenue. Main drivers for the mining sector would therefore include the future prospects for these mineral commodities.
Platinum Outlook

Platinum is both an essential and a precious metal utilized in a number of industrial processes, technologies and commercial applications. Its unique chemical and physical properties make platinum an excellent raw material, catalyst or ingredient for manufacturing processes. Consumer and industrial items made with platinum and other PGM’s include such items as flat panel monitors, catalytic exhausts, glass fibre, medical tools, computer hard drives, nylon and razors, among others.

Figure 13: Global Supply and Demand for Platinum

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Africa</td>
<td>4,860</td>
<td>4,090</td>
<td>4,120</td>
</tr>
<tr>
<td>Russia</td>
<td>835</td>
<td>800</td>
<td>780</td>
</tr>
<tr>
<td>Others</td>
<td>790</td>
<td>760</td>
<td>840</td>
</tr>
<tr>
<td>Total Supply</td>
<td>6,485</td>
<td>5,650</td>
<td>5,740</td>
</tr>
<tr>
<td>Gross Demand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autocatalyst</td>
<td>3,185</td>
<td>3,190</td>
<td>3,125</td>
</tr>
<tr>
<td>Jewellery</td>
<td>2,475</td>
<td>2,780</td>
<td>2,740</td>
</tr>
<tr>
<td>Industrial</td>
<td>1,975</td>
<td>1,605</td>
<td>1,790</td>
</tr>
<tr>
<td>Investment</td>
<td>460</td>
<td>455</td>
<td>765</td>
</tr>
<tr>
<td>Total Gross Demand</td>
<td>8,095</td>
<td>8,030</td>
<td>8,420</td>
</tr>
<tr>
<td>Recycling</td>
<td>(2,060)</td>
<td>(2,040)</td>
<td>(2,075)</td>
</tr>
<tr>
<td>Total Net Demand</td>
<td>6,035</td>
<td>5,990</td>
<td>6,345</td>
</tr>
<tr>
<td>Movements in Stock</td>
<td>450</td>
<td>(340)</td>
<td>(605)</td>
</tr>
</tbody>
</table>

Source: UBS

This year has seen a number of different trends in the platinum market. Primary supply is higher as South African mine production recovered from the strike in 2014, while recycling has been lower than last year as low prices reduced recycled jewellery supply and restrained the growth in auto catalyst recycling. Platinum demand is seen to stabilise its lower levels at 82000 oz. for 2015, and supply growth to 7730 oz. The lower demand for platinum and the diminishing value of the Rand against the US$ has pushed platinum prices to below US$ 1000 per oz. in 2015.

The platinum market is estimated to be close to being in balance in 2016 (with the next round of wage negotiations in South Africa due to take place in 2016, industrial action is possible which could adversely impact mine supply). In general though, price outlook is seen to be flattish.
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**Figure 14: Global Platinum Prices 1992-2014**

![Platinum Price Chart](image)

Source: Kitco

**Diamonds Outlook**

2014 saw a positive growth in world consumer value for diamond jewellery of 3% although some of this was due to the strengthening of the US$.

**Figure 15: Global Diamond Jewellery Review 2009-2014 ($US b.)**

![Diamond Jewellery Sales Chart](image)

Source: De Beers

Stabilising macro-economic environment and trade outlook indicate further growth in diamond jewellery sales across all main markets, and analysts are optimistic about slight firming in the important USA, Indian and Chinese markets. The outlook for diamonds is therefore firm, albeit cautious.
Coal Outlook

South Africa produces in excess of 255 million tons of coal (2011 estimate) and consumes nearly 75% of this output, 43% of its consumption being for electricity generation. In turn, 77% of South Africa’s energy needs are directly derived from coal, and 92% of coal consumed on the African continent. A quarter of SA coal is exported and is the 3rd highest foreign currency earner, after platinum and gold.

Coal continues to provide the backbone of the global energy system. The International Energy Agency’s (IEA) Coal Information 2014 report states that in 2013 global coal production increased by 0.4%, reaching 7 822.8 million tone, with world steam coal production up 1%, coking coal production up 1.6% and lignite production down by 5.5%. Importantly, the IEA noted in this publication that 2013 was the 14th year of consecutive growth in coal production, with 1999 being the last year when global production declined on an annual basis. Global coal production in 2013 was 74% higher in comparison to 1999. The report also noted that global coal exports grew by 4.2% to reach record levels of 1 333.3 million ton in 2013.

Coal prices have historically been lower and more stable than oil and gas prices and coal is likely to remain the most affordable fuel for power generation in many developing and industrialised countries for decades to come.

Figure 16: Global Thermal Coal Prices

Whereas there is much potential for the growth of mining in Limpopo, future expansion will largely depend on the state of the national and world economies, the international outlook for mineral commodities, and internal sector challenges of rising mining costs, available and committed investment levels, labour issues, ensuring a greener economy, and rising hopes and expectations of some communities of a better life from their mineral resources. One aspect seems certain, particularly from coal agreements with ESKOM at least, yet also from Provincial Government’s
commitment to promote foreign and domestic investment, and that is that the mining sector will continue to account for a very substantial share of the Provincial economy.

Although areas of mining only cover slightly more than 0.2% of Provincial area (and have remained fairly constant over the last 24 years) mining demand for human and other resources inevitably results in rapid development and increasing environmental degradation around mining areas. Required infrastructure, services, waste management facilities, and built environment growth, all increase the ecological footprint of mining, thereby contributing to environmental pressures that cannot be measured by area transformed alone. Moreover, mining requires water usage (often in places where access to water resources is difficult) and also shows to be injurious to air quality in Limpopo.

2.5 Land Reform

Historically, the Land Reform process has focused on three areas: restitution, land tenure reform and land redistribution. The predominant land reform programme that has been implemented in the Limpopo since the establishment of the land reform programme under the Department of Rural Development and Land Reform (DRDLR) has been the Land Restitution Programme.

As of March 2014 the DRDLR has indicated that a total of 4038 claims have been restored through the restitution programme. A further 2815 claims are considered unsettled. With the enactment of the Restitution Amendment Act, Act 15 of 2014 it is anticipated that a significant number of new land claims will be launched in Limpopo Province, particularly on Provincial Reserves and state land.

The land redistribution programme in Limpopo Province has not yet delivered land to beneficiary groups, households or individuals on a significant scale, with only 355 projects being recorded to date.

The DRDLR’s Minister has conceded that there are an unacceptable high number of underproductive or abandoned land reform projects, both restitution and redistribution, and has committed the DRDLR to a recapitalization programme to revitalize these ‘failed projects’. The abandoned agricultural lands place pressure on natural resources such as water, soils, grasslands and trees, with significant negative impacts related to fire wood collection and over-grazing, leading to increased soils erosion and water pollution. These factors also increase the spread of alien invasive species, uncontrolled burning and illegal poaching with snares and dogs and the destruction of key infrastructure such as dams, weirs and canals. Inadequate post settlement support therefore can lead to the serious deterioration of local habitats and the loss of natural resources, particularly water and fertile soils.

The political and social pressures on general land reform are such that much more land and tenure movements can be expected. Although it is accepted that such transfer of land ownership is essential, the viability and productive use of land over the medium to long term remains a key consideration.
3. Impacts and Trends

Figure 17 shows land cover change between 1996 and 2014.

![Figure 17: Land Cover Types Change 1996-2013 (ha)](image)

Source: GeoTerra 201

Of concern here and due to the value of grasslands to the livestock sector, is the conversion of grassland to mainly woodlands/open bush, and perhaps even thicket areas. Over the 24 year period reviewed, Provincial grassland has contracted by 778,000 ha, most likely due to overgrazing and the proliferation of invasive species or bush encroachment.

As an example, if the transformation of this grassland area has decreased grazing capacity from 2.5ha/LSU/year to 5ha/LSU/year, that would mean the need to destock by the equivalent of 155,600 LSU (probably equivalent to 12% of the Provincial herd). At a current LSU value of R8500, this change in land cover would have been a Provincial “natural capital” loss that is worth some R1.3 billion.

The apparent sharp growth of game farming as a farm enterprise indicates its economic advantage over more conventional enterprises, and it is probable that pressure will be placed on this sector and its natural resource base, especially where game and domestic stock compete for the same grazing resource.

No spatial breakdown is available for livestock statistics or farmed wildlife. Therefore it is not possible to accurately calculate existing stocking rates by livestock or biome type. The estimates in Tables 2 and 3 however indicate that the current Provincial stocking rate fall into a high average range of 6.5-6.8 ha/LSU.
Table 2: Estimated Stocking Rates

<table>
<thead>
<tr>
<th>Livestock nos.</th>
<th>Grazing availability (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stock nos.</td>
</tr>
<tr>
<td>Cattle</td>
<td>1057989</td>
</tr>
<tr>
<td>Sheep</td>
<td>258996</td>
</tr>
<tr>
<td>Goats</td>
<td>1143393</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1291721</td>
</tr>
</tbody>
</table>

| Probable average Limpopo livestock stocking rate (ha/LSU) | 6.8 | 6.5 |

Table 3: Livestock Numbers and Probable Stocking by Farmer Type

<table>
<thead>
<tr>
<th>Total</th>
<th>LSU Equivalent</th>
<th>Small farmers</th>
<th>Commercial farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>1057989</td>
<td>1057989</td>
<td>423196</td>
</tr>
<tr>
<td>Sheep</td>
<td>258996</td>
<td>43166</td>
<td>8633</td>
</tr>
<tr>
<td>Goats</td>
<td>1143393</td>
<td>190566</td>
<td>171509</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1291721</td>
<td></td>
<td>603338</td>
</tr>
<tr>
<td>Grazing availability (ha)</td>
<td>2863818</td>
<td>5984030</td>
<td></td>
</tr>
</tbody>
</table>

| Probable stocking rate (ha/lsu) | 4.7 | 8.7 |

Source: Calculated from various sources (Small farmer ownership of livestock assumed as: Cattle 40%; Sheep 33%; Goats 85%)

Bearing in mind that this estimated current stocking rate does not take wildlife into account (game competes with domestic stock for grazing resource) it would strongly indicate that generally Limpopo is heavily overstocked and the estimated stocking rates above are far heavier than the NDA recommendations shown in Figure 18.
Non-pivot commercial cropping has decreased together with subsistence cropping. Reasons for the latter are difficult to pin-point, but possibly it is due to a generally firmer economy since democratic elections, as well as a period of new economic opportunity. That trend is likely to now be reversed.

Irrigation farming has shown a slow growth which is likely to continue. While urban settlement area has increased, this has been in line with population growth rate.

Likely trends associated with major pressures are summarised in Table 4.

**Table 4: Land Transformation Trends**

<table>
<thead>
<tr>
<th>Potential land transformation agent</th>
<th>Trend</th>
<th>Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock grazing</td>
<td>Increase</td>
<td>Dependent on Provincial will and commitment.</td>
</tr>
<tr>
<td>Cropping</td>
<td>Increase</td>
<td>Will depend on irrigation availability. Higher interest rates and level of commercial farmer confidence will break expansion. Small farmer maize production could show expansionary pressure in marginal land in communal areas.</td>
</tr>
<tr>
<td>Mining</td>
<td>Increase</td>
<td>Biggest contributor to GDP (28%+) but low land coverage (0.2%). Expansion likely.</td>
</tr>
<tr>
<td>Urban settlement</td>
<td>Increase</td>
<td>Will tend to follow population growth rates.</td>
</tr>
<tr>
<td>Forestry</td>
<td>Increase</td>
<td>Little change and a small base. Deforestation could increase due to economic downturn and population growth.</td>
</tr>
</tbody>
</table>
The indicators considered on this chapter are listed in Table 5.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Priority</th>
<th>Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extent of natural land cover</td>
<td>High</td>
<td>Highly relevant to grazing capacity. Spatial analysis and data is required for District identification &amp; monitoring.</td>
</tr>
<tr>
<td>2</td>
<td>Spatial analysis of afforestation</td>
<td>Low</td>
<td>Low relevance due to small areas (indigenous forest 0.4%; plantations/ woodlots 0.6%)</td>
</tr>
<tr>
<td>3</td>
<td>Spatial analysis of deforestation</td>
<td>Medium</td>
<td>Small land coverage but provides energy requirements and has potential to escalate</td>
</tr>
<tr>
<td>4</td>
<td>Extent of degradation and transformed land</td>
<td>High</td>
<td>This is the focus of Provincial land management</td>
</tr>
<tr>
<td>5</td>
<td>Extent of agricultural areas</td>
<td>High</td>
<td>High relevance, particularly regarding food security monitoring.</td>
</tr>
<tr>
<td>6</td>
<td>Extent of urban areas</td>
<td>Low</td>
<td>Any denuded area around informal housing should be included.</td>
</tr>
<tr>
<td>7</td>
<td>Extent of mining</td>
<td>Low</td>
<td>Mining is only 0.2% of land cover (although its environmental impact falls into categories other than land).</td>
</tr>
<tr>
<td>8</td>
<td>Change in land use</td>
<td>High</td>
<td>Provincial overview. If categories could be sufficiently definitive, Indicators 2, 3, 4, 6 &amp; 7 could be included here.</td>
</tr>
<tr>
<td>9</td>
<td>Grazing capacity</td>
<td>High</td>
<td>Critical guide to sustainable livestock holding levels or capacity.</td>
</tr>
<tr>
<td>10</td>
<td>Livestock carrying rate</td>
<td>High</td>
<td>Measures the current stocking rate. Critical to monitoring and controlling stocking levels</td>
</tr>
</tbody>
</table>

4. Global Change Aspects

The major global change likely is climate change itself, being a long-term process which is characterised by warmer than average temperatures or global warming and rising frequency and intensity of extreme weather events, ranging from droughts to floods. The relationship between agricultural systems and climate change is complex and therefore remains a domain of intense debate internationally.

The kinds of risks to agriculture flowing from climate variability are the biggest this sector has to face, and climatic effects on farming spill over into the full economy. The RSA 2001 Strategic Plan for Agriculture highlighted the fact that the 2000 floods in Limpopo and Mpumalanga caused a drop in national GDP of 1%.

Climate change has been moving towards the centre of South Africa's agricultural policy landscape over the last decade and commercial farmers have joined the realisation that mitigating measures have to be taken. There is also growing realisation that development and environmental conservation are two sides of the same coin, and there climate change relief architects face a challenge as they move from a low carbon emission and climate resilient society level and now start to puzzle over how to also address key development challenges such as job creation, poverty eradication, and social equality.
Resource-poor small Limpopo farmers, mainly farming small maize fields under communal tenure, will be particularly vulnerable. Here investment in expensive farm inputs is minimal, the farmer support system inadequate, and rain-fed success paramount. There is therefore an urgent need to close an apparent gap between official policy-crafting and its grassroots implementation.

Appropriate mechanisms must be developed to transmit practicable knowledge of climate change alleviation and perhaps small farmers should be subjected to a regenerated and intensive extension programme designed around how they might cope. It is these social structures of climate change effect that deserve attention for climate change effect on land will occur where most of the people are and where probably techno-scientific fixes might appear to be too abstract resulting in little following and minimal understanding.

5. Responses

With South Africa beginning to experience the impacts of climate change, increasing awareness of its future likely impacts has led to individual provincial response. And here the Limpopo Province has been no exception.

An important first step was the preparation of the Limpopo Green Economy Plan. Thereafter major sectors and their comparative vulnerability were identified, which led to general planning of strategies as a coping mechanism. Such a project approach has been validated by relevant stakeholders this year.

Five major sectors were established as being particularly prone to climate change effect, and sector strategies were developed for each of them. These sectors were:

- Agriculture
- Livelihoods and Settlements – Rural and Urban
- Ecosystems – Terrestrial and Aquatic
- Water Supply
- Human Health

The responses for implementation plans now lie within each sector involved, and with both Provincial and National Government to strengthen mechanisms to make Limpopo more climate-resilient.
6. Identifying Scenarios

Three medium to long term scenarios (probably 10-25 years) have been developed in relation to the effect of climate change on land cover transformation:

Table 6: Scenarios for intervention of land transformation strategies

<table>
<thead>
<tr>
<th>Aspect</th>
<th>SCENARIO 1</th>
<th>SCENARIO 2</th>
<th>SCENARIO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning and control</td>
<td>No Government support (no budget change)</td>
<td>Partial Government support (partial budget change)</td>
<td>Strong &amp; effective Government support (full budget change)</td>
</tr>
<tr>
<td>Environmental monitoring</td>
<td>Ad hoc and reactive to Central Gov't. regulation</td>
<td>Partial planning and control</td>
<td>Full planning and control</td>
</tr>
<tr>
<td>Extent of natural land cover</td>
<td>Valuable Grasslands will continue to disappear by 32000ha/yr. Bush encroachment will reduce grazing potential by 40000ha+/yr.</td>
<td>Grassland transformation could be slowed down.</td>
<td>Little change to natural land cover (if the complex and important socio-cultural livestock holding system of the small farmer could be overcome)</td>
</tr>
<tr>
<td>Extent of agricultural areas</td>
<td>Commercial cropping is unlikely to change significantly. There is likely to be increased small farmer pressure (maize) for food security purposes. Suitable land availability (and water) would be a restraint &amp; more marginal land would be used.</td>
<td>Commercial cropping is unlikely to change significantly. Increased small farmer pressure (maize) for food security purposes. Suitable land availability (and water) would be a restraint.</td>
<td>Commercial cropping is unlikely to change significantly. Requires an intensive (inter-Departmental) programme to expand Small farmers as an entrepreneurial option (including rain water harvesting, land access, etc.).</td>
</tr>
<tr>
<td>Grazing</td>
<td>Severe lack of grazing for livestock on communal land. High stock mortality with reduced rainfall. Commercial farm livestock (inc. game) under strong pressure.</td>
<td>Severe lack of grazing for livestock on communal land. High stock mortality with reduced rainfall. Commercial farm livestock (inc. game) under strong pressure.</td>
<td>Requires courage and creativity (and community buy-in) to redress the chronic livestock holding system on communal land and overcome stock mortality. Commercial farm livestock would be under less pressure if Govt. could advise farmers on stocking rate monitor and control stocking.</td>
</tr>
</tbody>
</table>
7. Conclusions and Recommendations

This paper has reviewed major land cover transformation in Limpopo; has attempted to identify major pressure elements within transformation categories; and has evaluated trends. At the same time various scenarios covering degrees of Limpopo Government support have been suggested.

A lot of the information in this paper refers to the agricultural sector – and the reason for this is that not only does farming account for 90% of land coverage, but it is the land use category that reveals the biggest changes over a 24 year time span reviewed.

Within this category, specific land use pressure points that would particularly be exacerbated by climate change have been identified. These priority aspects and recommendations for their mitigation are summarised in the following table:

<table>
<thead>
<tr>
<th>Areas identified for priority action</th>
<th>Discussion</th>
<th>Action required</th>
</tr>
</thead>
<tbody>
<tr>
<td>General grazing areas</td>
<td>Although difficult to calculate because of the absence of spatial livestock nos. within spatial veld types, indications are that average carrying rate is a high 8.7ha/lsu. This excludes game counts which would intensify carrying rates.</td>
<td>a) Ascertain veld type areas and establish carrying capacities by type and state of veld.</td>
</tr>
<tr>
<td>Communal grazing</td>
<td>Communal grazing, supporting a livestock holding system, indicates an even higher carrying capacity of 4.7ha/lsu. This reflects the totally inadequate area for communal livestock resulting in severe environmental degradation.</td>
<td>(b) Implement a control mechanism to balance stock with sustainable grazing resource.</td>
</tr>
<tr>
<td>Diminishing Grasslands</td>
<td>Because of apparent overstocking, 40000ha of Grasslands are transforming every year.</td>
<td>c) Communal grazing pressure just has to be alleviated as it is totally inadequate. That would take political courage, community participation and technical skill. But an answer has to be found.</td>
</tr>
<tr>
<td>Overgrazing and grazing capacity</td>
<td>Commercial cropping has little effect on land cover transformation, although there has been an increase in irrigation (which climate change might not be able to sustain). Subsistence (mainly communal area) cropping is different as it has little land capacity left to expand in. Being largely dryland, further land transformation and food security is at risk.</td>
<td>Small farmer cropping requires an intensive inter-Departmental programme to expand small farmers as an entrepreneurial option (including rain water harvesting, land access, etc.). The small farmer base forms probably the largest existing platform for SMME’s and therefore deserves far more effective support particularly in the light of employment challenges and food security needs.</td>
</tr>
<tr>
<td>Cropping</td>
<td>Although a start has been made on the data collection front (LDA Directorate Spatial Information Services) more</td>
<td>Livestock census nos. should be established on a spatial basis that relates to veld type groups. That would not be easy but perhaps could be established.</td>
</tr>
<tr>
<td>Spatial information, monitoring and control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To avoid further adverse land transformation, which climate change is anyway likely to intensify, there appears to be 2 main areas that will have to be addressed. The first one relates to stocking pressure, particularly in areas of land under communal tenure. Then secondly concern is expressed for a ‘subsistence’ or small farmer cropping component which cultivates 62% of Limpopo’s area planted to maize.

South African history is littered with official attempts to try and control livestock populations in communal areas, yet the sector and production system remains resilient because of its socio-cultural depth (research has also shown that this low input-low output production system actually serves a number of rural household needs and as a result represents a logical economic choice). However, particularly from an environmental point of view, stocking density has to be addressed, even if it means acquiring more land for livestock holding under the communal system. This would be difficult and would take not only political courage, but sensitive and participative determination on the part of all stakeholders.

The small farmer cropping concern is more a predictive one (where in the current adverse economic outlook, expanding population pressures, and a key need to expand employment opportunity, more and more rural households will have to consider cropping to survive if nothing else). Such would lead to land transformation but particularly if more marginal cropping land was used, degradation would be serious. Yet small farmer cropping is also an opportunity area for entrepreneurial growth as it already operates from a large base, and is deserving of a more thorough and intensive support programme, including access to suitable land.

<table>
<thead>
<tr>
<th>Discussion Document</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detailed and regular information is required if detailed planning, monitoring and control is to be successful.</strong></td>
</tr>
<tr>
<td><strong>from Veterinary records or sample surveys. Census data should be reviewed regularly.</strong></td>
</tr>
<tr>
<td><strong>Spatial game census data is also required for the same purpose.</strong></td>
</tr>
<tr>
<td><strong>Carrying rates for identified veld types should be continuously monitored.</strong></td>
</tr>
<tr>
<td><strong>Strong remedial strategies should be implemented where necessary.</strong></td>
</tr>
</tbody>
</table>
References


Department of Agriculture (Directorate of Spatial Information Services). 2012. The mapping of Agricultural Commodity Production in Limpopo Province.


Discussion Document

Stats SA. Agricultural Survey 2012 (Preliminary).
