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Lower Olifants River: Economic Impact Assessment of the 2017/18 Drought

Macro & Resource Economics

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This report was compiled by the Division for Macro & Resource Economics of the Western Cape Department of Agriculture.

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List of Acronyms

DWS	Department of Water and Sanitation
GVA	Gross Value Added
LGO	Landbou Gemeenskap Ontwikkeling/Agricultural Community Development
LOR	Lower Olifants River
LORWUA	Lower Olifants River Water Users Association
UIF	Unemployment Insurance Fund
WCDoA	Western Cape Department of Agriculture
WMA	Water Management Area

EXECUTIVE SUMMARY

This economic impact assessment highlights the economic consequences of the 2017/18 drought in the Lower Olifants River region. The details presented in this report were compiled in order to provide guidance to decision makers in dealing responsibly to this disaster by both giving context of the importance of agriculture to the region and to explain the extent of damages as a result of lower water allocation to farmers. Water allocations to irrigators in the study area were curtailed by 76% for the entire season and this has resulted in a significant decline in agricultural production. Since the agricultural and agri processing sectors' contribution to the economy are more than 30% and employs more than 42% of the entire workforce, the drought is affecting the majority of households in the area.

The analysis shows that farm output in the region has declined by 44% on average across the various agricultural enterprises, whilst input suppliers have also been affected by farming decisions that attempted to mitigate the impact on farming businesses. The macro-level impact assessment shows that between 2016/17 and 2017/18 the farming sector in the study area incurred nett income losses to a value of R195 million. It has also been confirmed that the drought has resulted in around 260 permanent jobs being lost, whilst an estimated 75% less seasonal labour was utilised during the drought period. The farm-level analysis of two typical farms in the region reveals how different farming systems were impacted by the drought; both however incurred significant losses.

The findings in this report highlight the negative impact of the drought on the agricultural value chain. The estimated financial losses have meant that producers are under severe pressure to continue farming. Indeed, many farmers have had to restructure debt and are finding themselves in a precarious situation of having to get back to full production, but have limited cash-flow available to buy the required inputs to boost yields for the coming season. Thus, even though the Clanwilliam Dam has reached 99% recently, production levels are set to take time to recover. It is critical that any proposed intervention aim to boost farmers' cash-flow which will result in increased spending on inputs and more importantly re-employ lost labour in the area.

1. Introduction

The agricultural sector is well-known for being particularly exposed and vulnerable to adverse weather conditions and climate change. The availability of water is one of the most limiting factors affecting agricultural production, and the change in rainfall distribution has a widespread range of implications for commercial and smallholder farming in South Africa (WRC, 2016). The Western Cape is particularly susceptible to changes in climate since it is a winter rainfall region which is highly dependent on storing water to be used on irrigated crops during the summer months. During the past three years, the Province has received below-average rainfall which has resulted in dam levels reaching critically low levels and impacting both urban water users as well as the agricultural sector at large (WCDoA, 2017) .

Preliminary findings on the economic impact of the drought on South African agriculture indicated that the economy is expected to lose around R5.9 billion in aggregate income to the sector, and the impact on jobs and exports will be severe (Pienaar & Boonzaaier, 2018). The impacts measured here are a direct result of the drought, however it is also impacted by both water management decisions and, in some cases, poor resource management by various role players. The combination of these factors have resulted in the allocation of water to the Western Cape agricultural sector declining by 60% on average and by the end of January 2018 many agricultural water users had no access to water as most of this allocation had been used.

Some regions were affected worse than others. The Lower Olifants River is one such region with water allocation for irrigated farming cut to 85% as a result of limited water available from the Clanwilliam Dam. The population in the area is now facing extreme adverse economic and social implications that are threatening the livelihoods of thousands of people who are directly and indirectly dependent on a well-functioning agricultural sector. These value chains have sustained these communities for many decades and are now at risk of collapse, especially if another dry year is forthcoming.

With this in mind, the Western Cape Department of Agriculture (WCDoA) was requested to conduct an economic impact assessment of the 2017/18 drought in the Lower Olifants River (LOR) region, focussing on the impact of the drought on the agricultural sector and related industries. The objective of this study is to assist various decision makers in responding to the drought as well as to highlight key issues of resource management that have come to the fore in the current crises. This will be done in a systematic fashion, starting off with giving an overview of the economy in the study area and by analysing and depicting the importance of agricultural value chains to the regional economy. Next, the water management in the LOR region will be discussed, detailing the specific context in which the current drought is

impacting water management decisions. The results section reveal the economic and financial impact of the drought across the value chain as measured from the available information obtained during the assessment period.

The aim of this report is therefore to provide a detailed assessment to support the development of drought interventions which are critical and urgently needed. Following some drought scenarios, the report proposes recommendations which will aid in the process to develop effective interventions.

2. Socio-Economic Overview of Matzikama Municipal Area

The LOR region is for most part located within the Matzikama Municipal boundary, which is situated in the West Coast of the Western Cape. The municipal area consists of around 1.23 million hectares, and the most recent population count showed that around 64 000-69 000 people reside in this area (StatsSA, 2011 & 2016). In terms of demographic characteristics, the male-female ratio is evenly distributed, whilst the majority (82%) of residents belong to the Coloured population group. The home language spoken in this rural region is predominantly Afrikaans and 92% of all inhabitants consider themselves to be Christians. Vredendal is by far the largest town within the Municipality and is centrally located and considered the economic and administrative centre of the region. Table 1 below provides an overall profile of the area.

Table 1: Profile of the Matzikama Municipal Area

Variable	Unit	Value
Area	Hectares	1.23 million
Population		
Census 2011	Number	64 013
Community Survey 2016	Number	69 148
Demographics		
Gender	% Male	50.39
Coloured	Number	56 512
White	Number	8 493
Black	Number	4 121
Indian/Asian	Number	22
Main Language		
Afrikaans	%	92.62
Xhosa	%	3.38
English	%	0.6

Source: StatsSA, 2011 & 2016

In aggregate and measured using real 2017-prices, the economic activities within the Matzikama region generated a gross income of around R9.9 billion in 2017, of which R5.6 billion was used for intermediate consumption (production inputs). The total Gross Value Added (GVA) was therefore around R4.3 billion in 2017 and the trends for these indicators are illustrated in Figure 1 below. It is clear that the economy in the region is producing more goods and services over time, with the

GVA growing on average by around 1.94% per annum since 2007 (Quantec, 2018). However, since 2015 economic growth slowed down in the region and with the drought impacts only to be revealed in the 2018 statistics the expected growth prospect will be severely curtailed for a number of years.

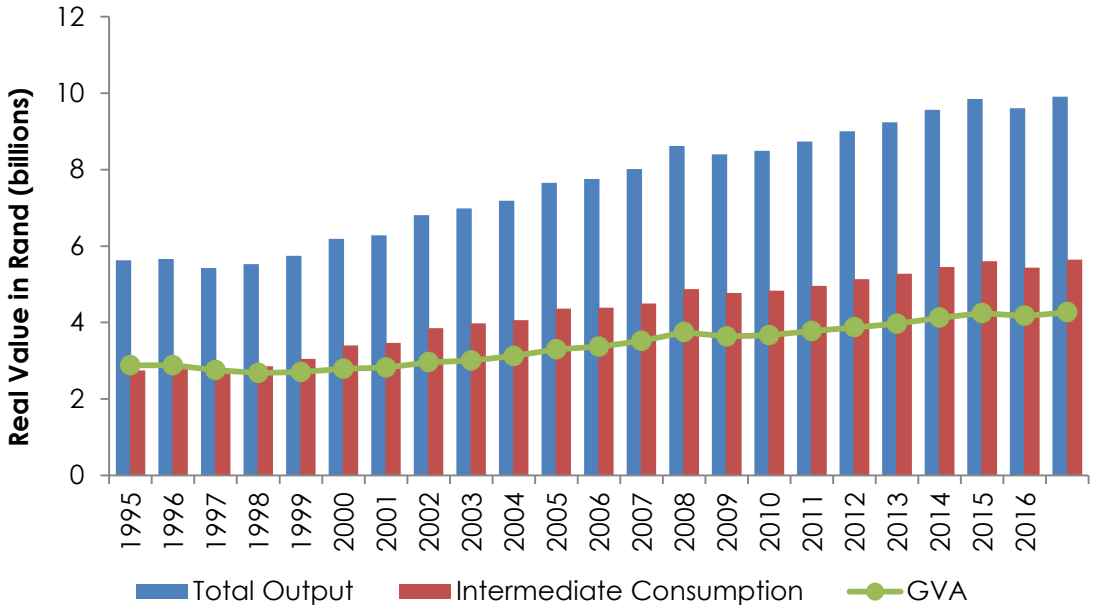

Figure 1: Economic output, consumption and GVA for Matzikama Municipality
Source: Quantec, 2018

To get a sense of the structure of the economy in the LOR region, Figure 2 shows the contributions the various sectors made to the GVA in 2017. It is clear that the business sector (wholesale, retail, finance and insurance) is the main contributor to the economy with 34%, followed by the agricultural sector which adds another 22% (Quantec, 2018a). However, when the agri processing sector is included, which is directly related to the agricultural sector, this contribution that the agricultural value chain directly contributes to the economy is more than 30%. It should be noted that many of the economic activities in this region are directly or indirectly related to agriculture and the statistic given in Figure 2 could easily underestimate the importance of agriculture to the regional economy for important sectors such as tourism, hospitality and retail trade. Furthermore, many more institutions are dependent on a thriving agricultural industry of which utilise various business services (e.g. financial institutions, auditors, agricultural machinery and implements etc.). Additional economic activities relate to government and social services (17%), manufacturing (5%) and mining (5%), whilst utilities and forestry & fisheries (1%) make up the rest.

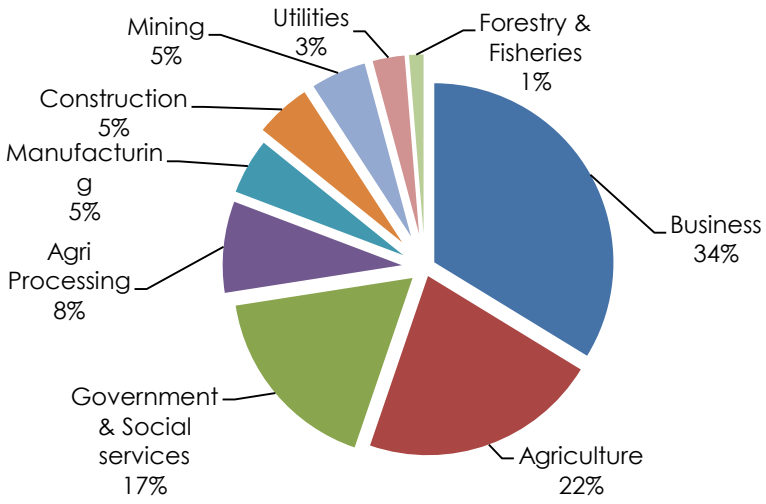

Figure 2: Sectoral breakdown GVA in the Matzikama Municipality
Source: Quantec, 2018

Looking at the labour force in Matzikama, Figure 3 shows the number of workers employed per sector. According to StatsSA (2011), there were around 30 000 people of working age, of which around 23 000 were employed. Using the broad definition of unemployment[1], the region currently has an unemployment rate of 14.5%; markedly low when compared nationally (29.5%) and provincially (21.3%) (StatsSA, 2011). Of those employed in the region around 8 500 people were employed in the agricultural sector making it the biggest employer in the region. When looking at the highest level of education attained it shows that it is mostly unskilled and semi-skilled workers of which 27% has only primary education and another 37% secondary (without finishing matric). The question that naturally arises from this statistic is what alternative employment opportunities exist for workers with these levels of skill in the face of potential job losses?

Agri processing facilities in Matzikama employ around 1 100 workers which make the total contribution of the agricultural value chain employment more than 42% of the entire workforce. Other large employers of individuals in Matzikama were social services (18%), trade (12%) and households utilising domestic workers (9%).

Various institutions are involved with farm workers and the recent estimates of employment in the study region align well with the number provided in Figure 3 below. According to the Agricultural Community Development (LGO, 2018) situated in Vredendal, there are around 6 000 permanent farmworkers of which around 90% stays on respective farms. Agricultural labour in the region also utilises seasonal labour at crucial periods during the season (harvest and pruning) which is estimated at around 1 000 agricultural jobs.

[1] The broad definition is given by: unemployed/(employed + unemployed)*100

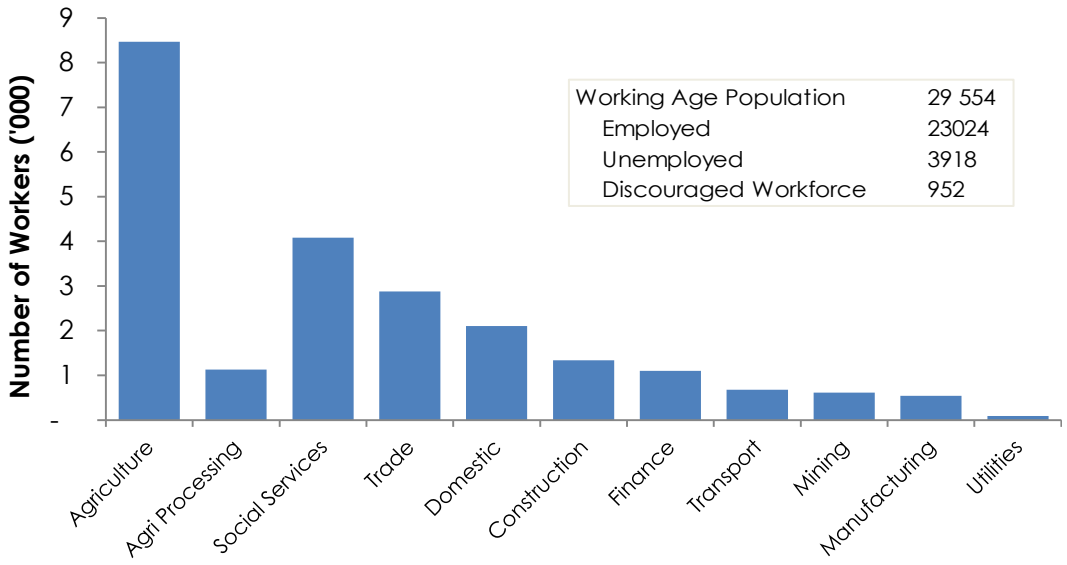

Figure 3: Employment per sector in the Matzikama Municipality
Source: StatsSA, 2011

The Western Cape's Farm Worker Census (2016) shows some important features of the agricultural labour market in the Matzikama municipality. Of the 489 agricultural households surveyed, 84% stayed in a house on a farm with access to electricity, drinking water and various other in-kind payments. The average wage for both general workers and tractor drivers were R2 995 per month, which is in line with the minimum wage determination for farmworkers set at R2 778 per month (Department of Labour, 2016). A recent audit also confirmed that farmers in the LOR comply with the minimum wage legislation (LGO, 2018).

3. Agriculture and Agri Processing in the Lower Olifants River

From this point forward agricultural value chains will be analysed with the focus exclusively on the specific study area; the irrigated farming enterprises directly linked to the LOR water users. At this point, it is important to note that the study area includes production activities of both the Matzikama municipality as well as a portion of the Cederberg municipality. The study area is clearly demarcated in Figure 4, showing agricultural production as captured during the most recent Flyover (2018) update of the region as well as the major towns and infrastructure supplying water to farmers. The thin grey lines along the Olifants River are the canals that are operated by the Lower Olifants River Water Users Association (LORWUA) which delivers bulk water to agricultural users in the area and will be further discussed in the next section.

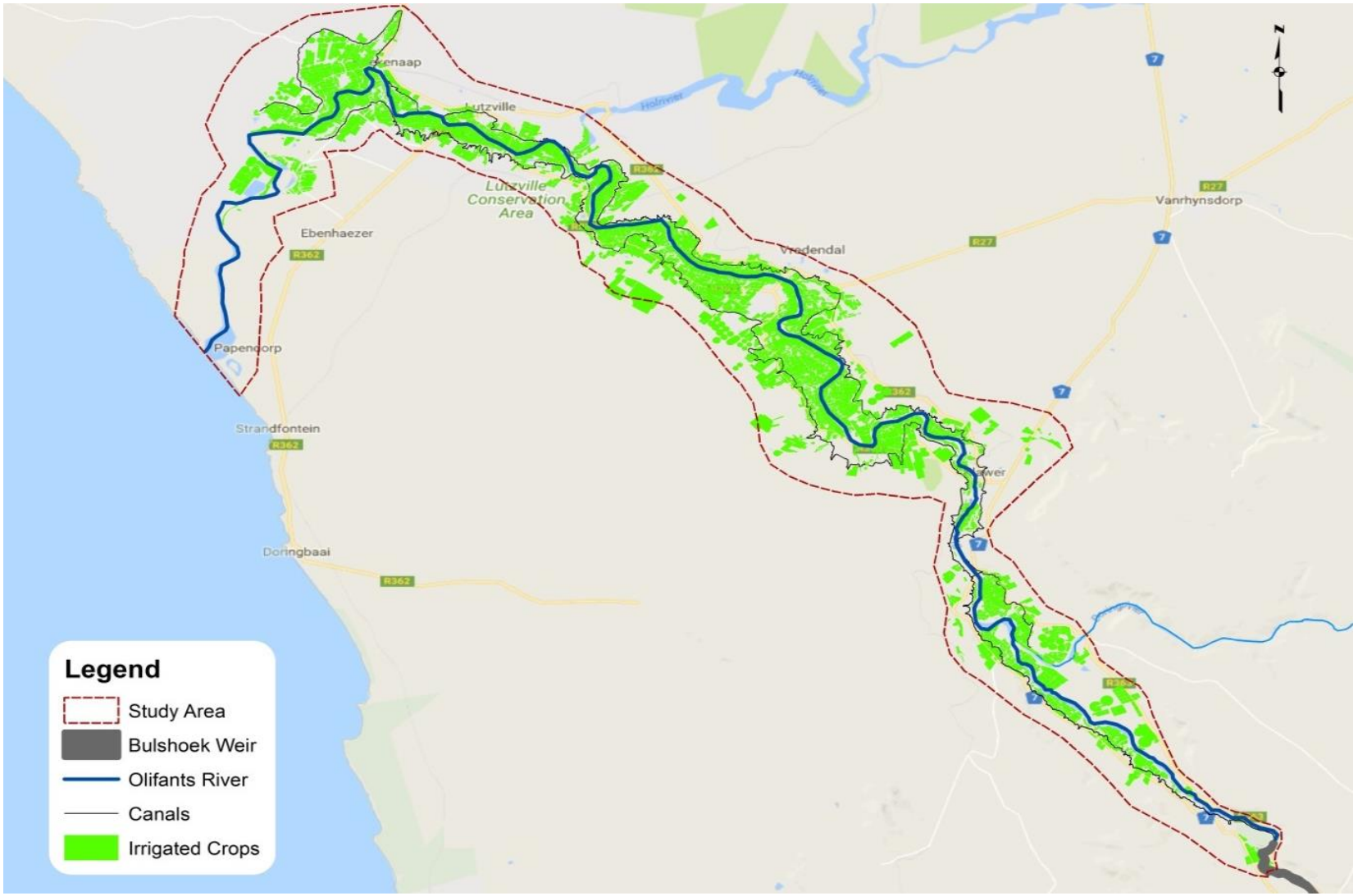

Figure 4: Map of the Lower Olifants River study area

Source: Own Compilation from various sources; Flyover 2018

The dominant agricultural industries in terms of area planted are given in Table 2, which also gives an estimated gross value of production and job numbers[2] for the season prior to the drought. Wine grape production is the biggest agricultural activity with around 8 400 hectares under production, generating a gross income of around R437 million during the 2016/17 season. Close in second is table grapes which, although being much smaller in area planted at 1 070 hectares, generates another R427 million gross income to the farming sector. Prices per unit of table grapes are much higher than wine grapes due to the strong global demand for export quality grapes. In recent years, dried grape production in LOR has seen very strong growth in area planted, mainly driven by much higher returns when compared to wine grapes. In 2016/17 there was around 750 hectares of dried grapes planted and rapid expansion is expected in the next two to three years. The global supply of dried grapes from key producing regions in Europe has been on the decline which has led to export prices increasing significantly. Collectively, grape farmers employ the biggest proportion of farmworkers in the study area with around 4 500 jobs.

The study area is also known for vegetable production during the winter months, supplying much-needed additional cash flow to farmers, producing tomatoes, potatoes, butternuts and onions, amongst others. In total vegetable sales provide aggregate income to producers in the region of around R213 million, whilst a few producers also plant vegetables for the seed input suppliers, adding another R65 million to the output of the agricultural economy.

Table 2: Agricultural production in the Lower Olifants River

Crops	Hectares: 2016/17	Gross Value of Production[3] 2016/17 (R millions)	Total Jobs
Wine grapes	8462	436.89	2539
Table grapes	1070	427.09	1733
Tomatoes	250	98.11	225
Dried grapes	750	68.15	225
Factory Tomatoes	350	47.25	315
Potatoes	150	28.88	85
Sweet Potatoes	100	14.62	90
Butternut	150	16.55	135
Onions	51	8.38	46
Vegetable Seed	360	65.10	324
Total	**11693**	**1211.01**	**5717**

Source: Own Compilation from various sources; Flyover 2018

Naturally it is impossible to calculate the turnover of all fruits and vegetables seeing that there are small pockets of different smaller crops and vegetables such as citrus, stone fruit and other vegetables. Again, the agricultural enterprises listed above

[2] *Job numbers are estimated based on employment multipliers per hectare*

[3] *These are calculated by using average prices and yields for products in the region and confirmed by various sources*

suggest that around 5 717 jobs are created at farm-level if one uses standard employment multipliers per hectare (WCDoA, 2018a).

3.1 Wine production

As previously noted, the wine industry is the biggest agricultural industry in the region, both in terms of area planted and the gross value of production. It is therefore also the biggest buyer of inputs such as fertiliser, labour and chemicals. It is imperative to understand both the context and the dynamics in this industry to later fully grasp the drought impact.

Wine farmers in the region have been under pressure for some time now as wine prices for the past decade have declined in real terms meaning that farmers' incomes have not kept up with inflation. This coupled with input costs growing at a much faster rate than income has led to a serious farmers' dilemma. Figure 5 shows average prices for wine grapes grown in the study area (both in nominal and real terms) and the associated average production costs per hectare. In real terms, prices paid to farmers in the region have been declining for most part of the past decade, with some relief for farmers the past season. It is debatable if such price increases will hold in the medium term, whilst it is almost certain that input prices will continue its upward movements due to the various economic factors affecting trade. According to Vinpro's (2017) study group of farmers in the LOR, farmers spend on average R49 478 per hectare on all production costs, leaving farmers with a Nett Farm Income (NFI) of R7 310 per hectare. It must however be added that in these calculations the average yield was 26.98 tons per hectare of which many farmers struggle to reach due to various structural challenges.

Figure 5: Wine prices and production costs, 2007-2018
Source: Own Compilation from SAWIS (2018), *Vinpro (2017) &* (WCDoA, 2018b)

The realities sketched in Figure 5 have resulted in producers not replacing vineyards at the desired rate to maintain current or higher production levels in the region.

Traditionally the desired norm of replacement is 5% of the total area planted each year so that over a 20-year period a farmer sufficiently enables stable production. Clearly, as reflected in Figure 6, the vineyard age distribution in the study area suggest that 1) orchards are ageing rapidly and 2) the percentage of vineyards within the zero-to-three-year bracket has been declining over time. This then leads to the overall ageing of vineyards where the percentage of vineyards over twenty years has grown from 18% to more than 35% in 2017 (SAWIS, 2018). The inevitable medium term impact of these on-farm decisions is set to result in aggregate declining production levels of wine grapes for the foreseeable future.

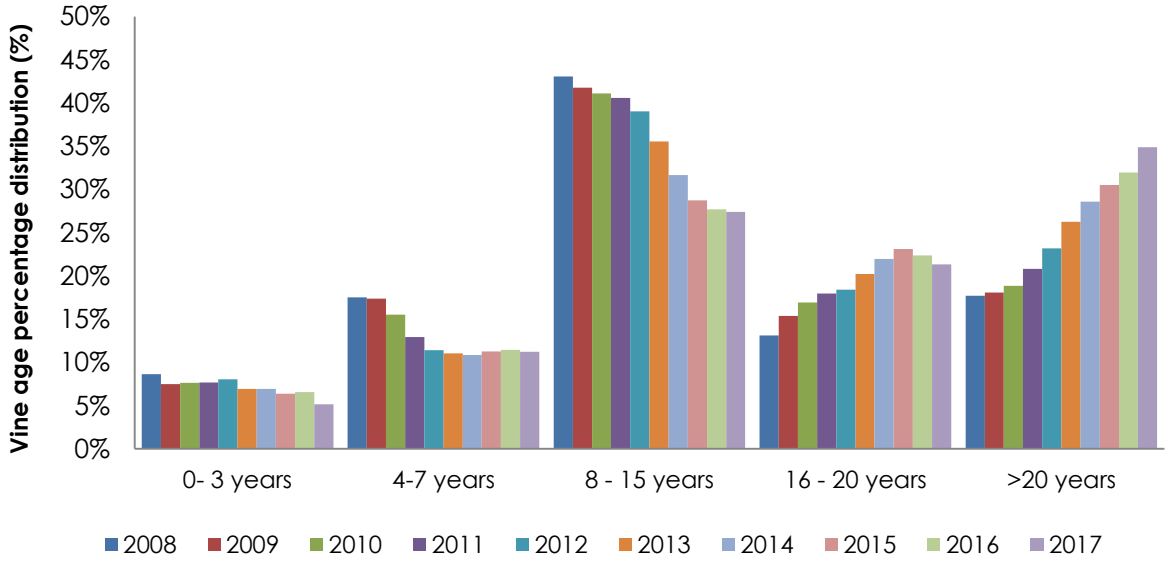

Figure 6: Wine prices and production costs, 2007-2018
Source: Own Compilation from SAWIS (2018)

Within this context of ageing orchards, input costs rising faster than price increases and a lack of re-investment; farmers will increasingly struggle to reach their cellar deliveries in the future. There is also some concern within the region regarding existing institutional arrangements and quotas (or shares) for grape deliveries between farmers and the cooperative cellars.

The current system functions as such that the cooperative cellar has a fixed number of farmers with shares in the cellar. This in turn gives members the right to deliver a specified volume of grapes per annum. Within the statutes of this arrangement, cellars deduct a "fixed-cost component" from pay-outs to farmers which is calculated by taking all fixed costs of the specified cellar and dividing it either by the tons delivered or the tons listed. In the past this mechanism was developed in order to ensure that cellars can cover their costs even when production is down and indirectly also ensure stable delivery of grapes in the long term.

The 2017/18 drought has brought a renewed emphasis on this institutional arrangement with wine grape deliveries for one of the cellars down by 48% in

volume terms. In essence this meant that, on aggregate, farmers have to contend with receiving half of their normal income and in most cases had to pay additional levies to cover the fixed cost component of the cellar on the full quota allocation. However, it should be noted that amidst the dramatic impact of the drought on volumes, the strong increase in wine prices that was driven by an international shortage of bulk wine has softened the impact of the drought significantly. Prices for wine grapes in the LOR have increased from an average price of R1976 per ton in 2017 to an estimated R2327 per ton in 2018; an 18% increase this season. However, such price increases were not unilaterally realised across the board and was dependent on various factors such as the cellar's financial position and the structure of their market output (bulk vs bottled and local vs international sales etc.).

Finally, the last part of important context needed to understand the drought impact on wine grape farmers is that 85% of all the grapes produced in the region are destined for the cooperative cellars in the region. With some variations, payments to farmers are done within a specified cycle of instalments into the future. Thus, this season's lower pay-out to farmers will not only influence cash flow negatively in the short run, but will do so for an extended time period looking ahead. This also comes at a time when many farmers also received less income from annual crops which normally generate immediate compensation to be used to manage on-farm cash flow.

3.2 Table & Dried Grapes

Within the context of wine production's marginal income realisation over the past decade, many farmers have ventured into other forms of production to diversify their income streams. It is therefore no surprise that there has been a substantial expansion in the area planted for both table and dried grapes respectively, as shown in Figure 7. This land-use trend bodes well for agricultural development in the LOR since it provides for relatively higher nett returns per unit of production and both of these farming enterprises utilise more labour whilst at the same time encourage additional investment on farms in order to remain competitive.

Though positive, the expansion noted above also means that producers have had to source additional funding to finance these investments of which many come from agricultural financiers. Investment decisions are therefore based on multi-year budgets spread out over a 20-30 year time horizon to pay back the additional debt. The drought has also impacted these crops substantially as will be seen in the next section and many farmers have had to restructure debt obligations to continue farming which adds substantial strain on these businesses.

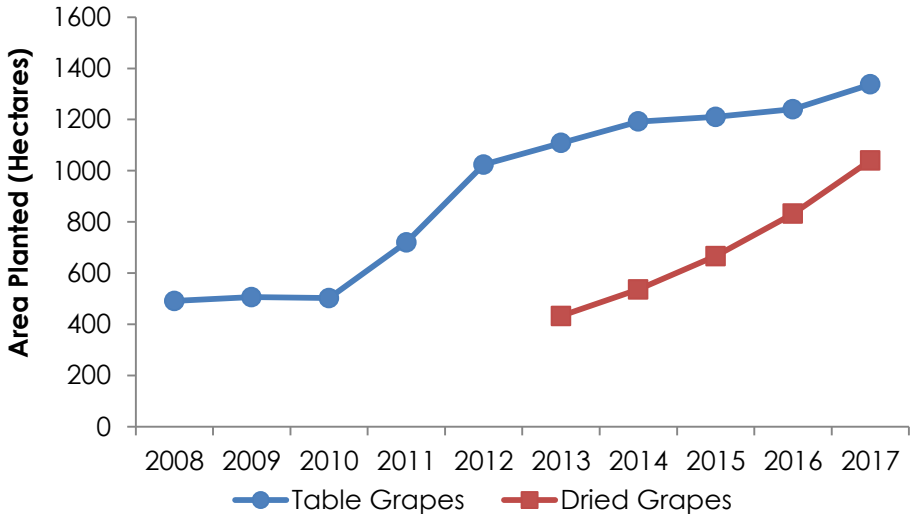

Figure 7: Area planted in the Olifants River, 2008-2017
Source: Own Compilation from SATI (2017) & Flyover (2018)

3.3 Value Chain Analysis

In order to understand the flow of inputs and outputs, throughout the agricultural value chain in the LOR, Figure 8 shows a schematic illustration that highlights the importance and inter-connectedness of the agriculture sector to the wider economy.

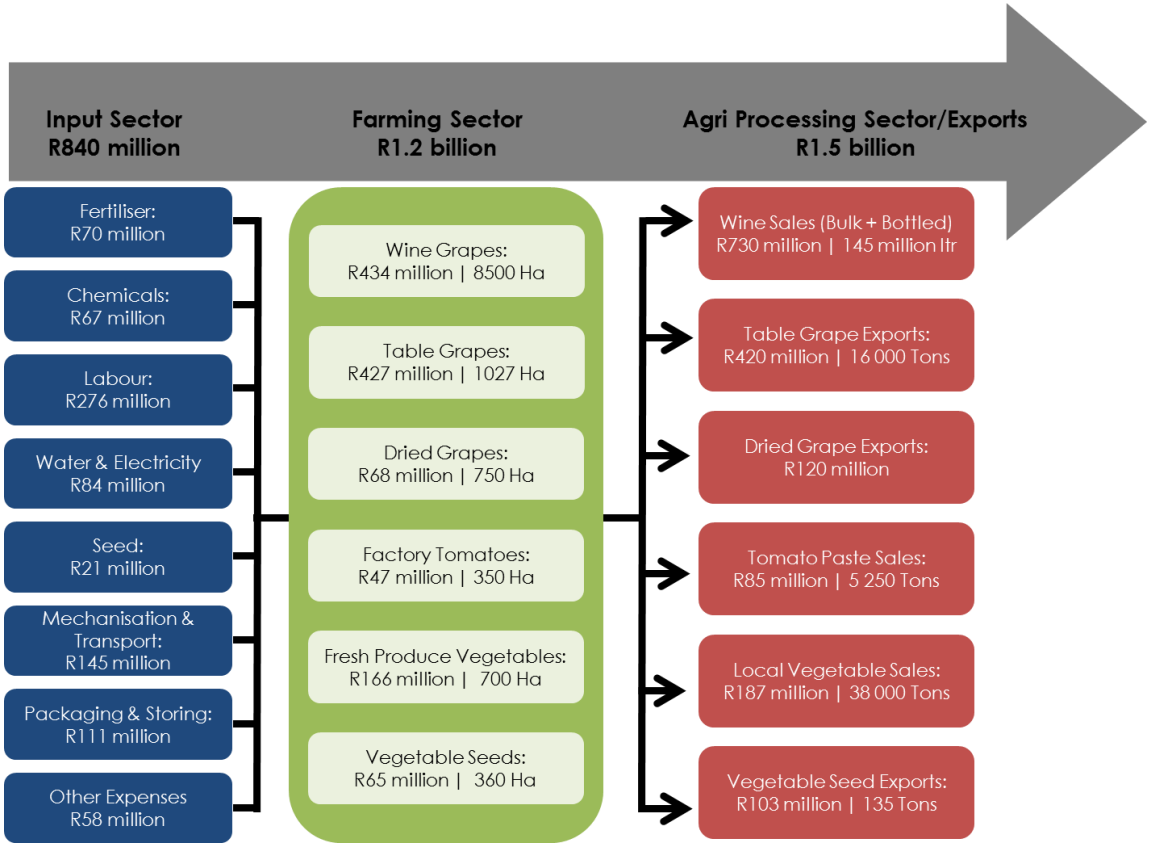

Figure 8: Agriculture Value Chain diagram of the study area
Source: Own Compilation using various sources, 2018

Starting with input supply, farmers procured inputs in the 2016/17 seasonal valued at around R840 million. These industries are heavily dependent on a well-functioning agricultural sector, and will thus incur significant impacts due to an external shock such as a drought.

By far the biggest input to the production function is the labour component with a total annual wage bill in the study area estimated at R276 million. The agricultural sector therefore provides decent livelihoods to thousands of families of which many live on-farm and receives additional in-kind payments. Other notably large inputs includes fertiliser products (R70 million) and chemicals for spraying (R67 million). Annually, farmers bought seed valued at around R21 million, whilst transport and mechanisation added another R145 million to the economy. Finally, farmers paid around R31 million for water, whilst municipal taxes amounted to transfers of around R5.8 million. This again highlights the dependence of many organisations and institutions on a well-functioning agricultural economy.

The output of the farming sector has already been tabled in the previous sector but in summary, aggregate expenditure by the farming sector for 2016/17 was an estimated R840 million (this excludes provision for renewal, entrepreneurial wages and income as well as company tax) which results in a conservatively estimated gross income of R1.2 billion. Thus, the agricultural sector's value added to the regional economy is an estimated R385 million.

The importance of agriculture should also be highlighted for its linkages with both the agri processing and fruit export sector. These businesses utilise additional resources to add further value to products which in turn derive higher prices when it reaches the end user. Using various industry norms, the gross value of these products is also calculated. Wine grapes delivered to various cellars are processed to produce around 145 million litres of wine with a wholesale value of around R730 million. Some proportions of this wine still go into bottling and exports which generate additional value-add. Around 90% of the region's table grapes are exported generating income of around R420 million, whilst that of dried grapes were in the region of R120 million. Tomato paste production also enables additional gross revenue of R85 million by means of producing around 5 250 tons of tomato paste.

Fresh vegetables from the region sold at various fresh produce markets and retailers across the country have an estimated value of R187 million, whilst the vegetable seed exports generate around R103 million. Combined, the agri processing of agricultural goods produced in the study area generates economic output of around R1.5 billion. This illustration therefore shows the importance of the agricultural sector for economic growth and job creation much wider than the sector which of itself also makes a substantial contribution to the regional economy.

4. Water Management in the Olifants River

In this section the importance of water management is discussed within the context of key challenges surrounding the supply of water in the study area. One of the critical risk areas for this region has been the availability of water resources due to the dry and arid climate of the Olifants/Doorn Water Management Area (WMA). It is well-known to be vulnerable to prolonged periods of no rain (SmartAgri, 2015) and is therefore highly dependent on the Olifants River to deliver water in the WMA where it feeds into the associated canal system in the LOR. Figure 9 below gives a schematic illustration of the water management within the study area and highlights key issues to consider in the current context of the drought.

4.1 Water Management and infrastructure

Starting from the most Southern part, the Olifants River flows past the town of Citrusdal and into the Clamwilliam Dam with a mean annual runoff of 356 million m^3. This implies that water users upstream of the Dam receive the first option on water supply, leaving those situated downstream dependent on what is left in the system thereafter. At this point it is worth mentioning that before any restrictions were announced in the region; many farmers in the Upper-Olifants River had the opportunity to fill up their dams, whilst there is also the concern of unlawful expansion of irrigated agriculture that diminishes the supply of water downstream. The fact that around 1 300 hectares of additional citrus have been planted in the Cederberg municipality in the past three years supports such claims (Flyover, 2018).

Climatic conditions in the region also vary considerably given the variation in topography with mean annual precipitation of 1 500 mm in the Cederberg, decreasing sharply towards the flatter north and west areas to between 100 and 200mm (DEADP, 2011). Water users in the LOR are therefore greatly dependent on the bulk water infrastructure to support irrigated agriculture which received limited rainfall during the past winter and needs to utilise this water in the summer. Dependence on rainfall may be further exacerbated as modelled scenarios of climate change over the next 50-100 years show that the area may potentially receive up to 15% less rainfall in future (DWAF, 2005). The LOR valley also experiences high levels of evaporation as the highest minimum and maximum temperatures are consistently recorded in the region throughout the year.

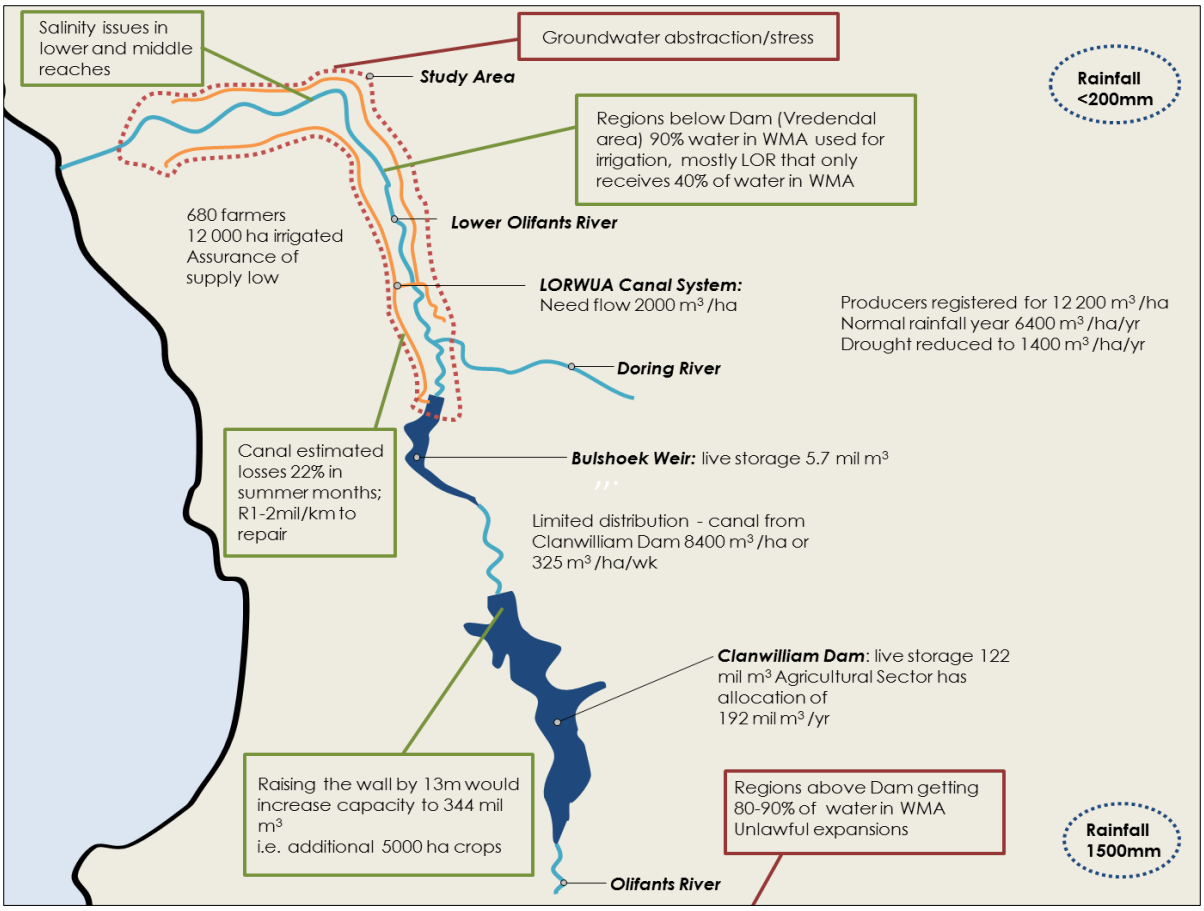

Figure 9: Water management within the study area
Source: Own Compilation using various sources, 2018

In 1935, the Clanwilliam Dam was built with a gross capacity of 77.64 million m³ to support 8 500 hectares of irrigated land along LOR and Vanrhynsdorp district. In the 1960's the Clanwilliam Dam was raised to its current capacity of 122 million m³ and since then improvements and extensions have been made to the scheme at various intervals (DWAF, 2005). Around 26 km downstream from the Clanwilliam dam the Bulshoek Weir is located which supports the entire management of water to the study area by means of canals emanating from the Weir. These canals are owned by the Department of Water and Sanitation (DWS) and operated by the LORWUA which is currently supplying bulk water to the municipality, farmers and industry. Industry is guaranteed 90% of their water requirements in normal years and farmers get between 60-70% of their water requirements dependant on the capacity of the Clanwilliam Dam and canals in any given season.

Water is released from the Clanwilliam Dam (live storage 122 million m³) into the Bulshoek Weir (live storage 5.7 million m³) (DWAF, 2005) and then into the 320 km canal system. As can be seen in Figure 9, the canal supplies water to agricultural users on both sides of the river and does so at a rate of 26 000 m³/hr (at the Klawer bridge the canal splits into two of 13 000 m³ each). Water is managed on a quota system that is calculated at the end of September each year. Farms are enlisted to

receive 12 200 m^3/ha/annum in a normal rainfall year. The allocation for irrigation is approximately 8 000m^3/ha/annum during the summer months (October to May). Farmers submit their water requests to LORWUA on a weekly basis and the flow is generated by computer software. LORWUA manages supply by releasing water into the canals for a week and stopping water flow for two weeks for maintenance during winter (LORWUA, 2018). Currently, a general rule of storing two weeks' water at all times applies to farmers. Around 680 farmers are charged R3 600 per listed hectare over 12 months where under normal rainfall conditions, a 30 day+ payment policy would apply with 4-5% interest rate for payments in arrears. As a result of the 2017/18 drought; interest rates may increase to 11% (LORWUA, 2018). Important to also note is that farmers pay the R3 600 per hectare regardless of the supply of water provided by the system, putting additional strain on their businesses during the drought.

Water Management is challenged by institutional arrangements, ownership, affordability and financing (DEADP, 2011) and one of the critical issues identified in the Smart Agri (2015) study is that the assurance of supply is impacted by over-allocation on the Clanwilliam Dam and capacity constraints of the canal system (SmartAgri, 2015). The ageing canal infrastructure contributes to system losses which have been further exacerbated by the drought. High levels of evaporation, together with repair work to the canal system, results in 20-30% water loss in the scheme (DEADP, 2011; LORWUA, 2018). Irrigation return flows and decreases in rainfall, particularly at low river flows, increase salinity in the middle and lower reaches of the river leading to sub-optimal soil conditions (SmartAgri, 2015) and concerns for long-term sustainability. The proposed raising of the Clanwilliam Dam wall by 13m (along with improvements to the canal system) would increase the capacity to about 344 million m^3 and would make water available for nearly an additional 5 000 hectares of new crop establishments.

4.2 The 2017/18 Drought

Dam levels across the Western Cape have been steadily declining since 2015. On 24 May 2017, the Premier of the Western Cape declared a Provincial Drought Disaster and on 31 October 2017, the DWS Gazette issued curtailments of 50% for domestic use, 40% for industrial use and 60% for agricultural water use. The Provincial Drought Disaster was re-classified as a National Disaster on 13 February 2018 and by 19 February 2018; dam levels were critically low at 22% versus 33.1% for the same period in 2017.

The West Coast District Municipality was declared an agricultural disaster area in 2017 as a result of the Clanwilliam Dam only filling up to around 40% after the winter rains where it a normally reaches overflow. Thus, with the onset of the 2017/18 irrigation season, LORWUA had to impose curtailments far beyond that of the rest of

the agricultural sector, limiting water-use to irrigators from the normal listed 12 200 m^3/ha to only 1 700 m^3/ha during the summer months (LORWUA, 2018). These curtailments are given Figure 10 below which shows the actual water allocation to farmers for the past 2017/18 season as opposed to their normal long-term average allocation (grey-dotted lines); a decline of 76% for the entire season.

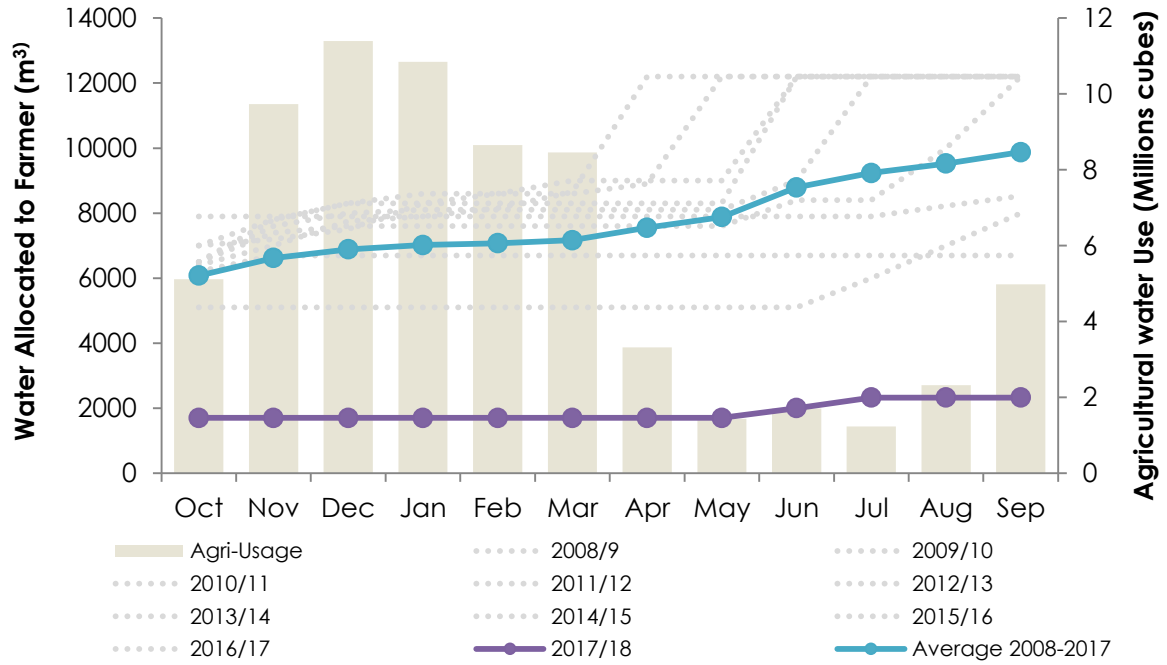

Figure 10: Water allocation to LORWUA irrigators
Source: Own Compilation from LORWUA, 2018

Level 5 water restrictions came into effect on 15 March 2018 where residents would then be restricted to 20kℓ of water per household per month (WCDOA, 2016) and it was reported that farmers in the region needed to find alternative sources of water (EWN, 2018). The area faced "day zero" with only a week's supply of water in the system with water restrictions above 80% before the first rainfalls in May 2018 (LORWUA, 2018). It is important to note that even if the rainy season is above normal or extreme, the impacts will affect the whole valley into 2018/2019 and beyond.

Discussions with farmers in the region suggest that various mitigating strategies were employed to minimise the impact of the drought on both the yield and quality of the produce. This was done by allocating water to crops with the highest potential for income generation (mostly table and dried grapes), whilst carefully cutting costs on inputs. Some have utilised groundwater mixed with existing on-farm dam water to lower the concentration of salts from the groundwater, whilst others have abandoned large portions of vegetable production. Across the board, farmers have been forced to utilise less labour resulting in significant labour losses and lower income to the agricultural labour force. The next section will venture into explaining the extent of the impact of the abovementioned water shortages during the past season in the Lower Olifants River.

5. Impact Assessment of the Drought

In order to determine the economic impact of the 2017/18 drought, it is important to understand the key macro-economic drivers affecting this impact. Naturally one would expect both the quantity and quality of produce to be affected on the supply-side of the agricultural value chain, but additional impacts such as product price movements and exchange rate fluctuation play an essential part in the magnitude of the overall impact. It should be noted that earlier attempts to quantify the impact of the drought have been made which this report has used as a starting point (LGO, 2017; Vos, 2018; Matzikama Municipal Advisory Forum, 2018). However, these studies were compiled and submitted before the full impacts could be analysed using actual production volumes and prices for the 2017/18 season.

It is also clear that water shortages have also affected the various agricultural industries differently. For instance, the major impact on vegetable production was driven by lower area planted. In the case of factory tomatoes, the processing facility closed down for the entire 2017/18 planting season which meant that around 30 000 tons of tomatoes were not scheduled for planting in Lutzville and surrounding areas. It is also clear that individual farmers have utilised various mitigating strategies to manage the adverse impacts of the drought on their production output, and it is impossible to analyse each one of the farmers in the region. The methodology described below is that of an impact assessment and should not be likened to an investigation of audit findings. The methodology therefore was determined both by the scope and timeframe of the project. In order to fully diagnose the impact of the drought it was decided to include all the major components of the main agricultural value chains in the Lower Olifants River irrigated region.

5.1 Methodology

The methodology utilised in this assessment is industry-level analysis similar to that utilised in the Drought Policy Brief (Pienaar & Boonzaaier, 2018). The assessment is based on agricultural norms and standards for each crop grown in the region and required various simplifying assumptions.

The analysis was informed by semi-structured interviews with input providers (chemicals and fertiliser), farmers (wine, table and dried grapes; tomatoes and other veggies) and the major cellars. Each interview comprised of a series of questions relating to the drought impact, mitigating strategies and the outlook going forward. Additionally, for each farmer a detailed cost structure was developed which would clearly indicate the upstream and downstream linkages with input providers and buyers of agricultural goods. Additional telephonic interviews were also conducted after the research team did the fieldwork in the area which included interviews with specialists in the area.

These discussions, as well as detailed information provided by the respondents, allows for analysing the drought impact to very closely reflect the actual impact on the ground. Where there was a lack of information, additional support was provided by industry and growers organisations that work closely with farmers in the region.

The approach to analysing the sector-level impact was to treat the entire region as one farm with various enterprises and a particular dependence on inputs and prices. Information on the latter was obtained by farmers and some were available from secondary sources. Based on the intelligence gathered from the interviews, the research team was able to calculate the net impact of the drought.

5.2 Drought Impact on the farming sector

The impact of the drought via the drastically lower supply of water to farmers is summarised in Table 3 below. For each industry an aggregate impact is determined based on the actual declines in production output. Before delving into the details, the most important finding from the assessment is that the nett impact of the drought, as per comparison of the normal income of the region (2016/17) to the current situation (2017/18), is estimated at R194 million. Overall, production volumes in the study area were down 44% which was both as a result of lower yield and area planted (mostly vegetables).

The two biggest agricultural industries in the region, wine and table grapes made actual losses of R17.8 and R10.4 respectively. This is based on calculated adjustments[4] to input spending, particularly fertiliser, chemicals and labour. These adjustments were, however, not enough to offset the more significant impact of lower volumes.

Table 3: Impact of the drought in the study area

Industry	Yields		Production ('000) Tons			Nett Income (R million)		Nett drought impact on GVA (R million)
	2017	2018	2017	2018	% Change	2017	2018	
Wine grapes	27	17	221	140	-36	35.3	-17.8	-53.1
Table grapes	17	12	18	13	-29	74.9	-10.4	-85.3
Tomatoes	70	70	18	8	-52	29.7	11.9	-17.7
Dried grapes	7	4	5	4	-31	26.5	15.7	-10.8
Factory Tomatoes	90	90	32	2	-93	13.1	0.9	-12.2
Potatoes	50	50	8	3	-57	2.3	0.8	-1.5
Sweet Potato	40	40	4	2	-50	3.7	1.4	-2.3
Butternut	40	40	6	3	-50	1.6	1.9	0.3
Onions	50	50	3	1	-53	-0.5	0.7	1.2
Veg. Seed	0.44	0.4	0.16	0.06	-63	22.1	8.6	-13.5
Total	**-**	**-**	**313**	**177**	**-44**	**208.7**	**13.8**	**-194.9**

Source: Own Compilation from the research team

[4] These adjustments are based on the intelligence gathered from interviews with farmers and input suppliers

Dried grapes in the region did well during the past year and despite volumes being down around 31%, price increases have ensured a nett positive income of R15.7 million (still substantially down compared to the previous season).

Vegetable production for the 2017/18 season declined by more than 50% across the board with area planted for all vegetables changing from 1051 ha in 2016/17 to 360 ha in the drought situation. Combined, this has resulted in GVA losses of R32 million for vegetable producers. Finally, vegetable seeds (mainly brassica, squashes, lettuce and dried beans) were also impacted by the drought, where in 2016/17 farmers received R22 million for their efforts could only realise R8.6 million due to water constraints. These financial implications do not, however, include the longer-term impacts of the drought such as concerns around the health of the vineyards and orchards in the region.

Farm-level Analysis:

Since it is very difficult to assess the extent of the drought by only considering the macro-economic impact, this section will utilise actual information on income and expenses from farmers in the region. Two typical mixed farms are modelled and the impact of the drought on each is is given by comparing financial information between 2016/17 and 2017/18.

Table 4 gives the drought impact on a typical grape farm with the main enterprise being table grapes, with dried and wine grapes providing additional income. The entire farming unit is 70 hectares and is focussed on exporting table grapes. Comparing the 2016/17 income of R10 million with that during the drought of R6.5 million shows the impact on gross income was around R3.5 million. This decline was a result of lower yields for table grapes by 50% and wine grapes by 54%. Dried grapes had a marginal increase due to prioritising water allocation to these blocks and because these are relatively new plantings moving into bearing age.

Turning to the production costs associated with this income shows interesting on-farm dynamics regarding managing costs during the drought. Farmers in such a typical farm managed to significantly decrease expenditure on fertiliser (33%), chemicals (27%) and labour (25%), whilst other costs such as packaging & cooling and transport were substantially lower due to the lower volumes harvested. Noticeably the value of water and electricity was marginally higher which is due to farming having to pay the inflation-adjusted prices for water on the full allocation and not on what was used during the drought season. In total, the expenditure for this typical farm was only 2% lower than the previous, mainly due to continued investment in the farm regardless of other mitigating strategies. Thus, once all the income and costs are accounted for, this typical farm made a loss of R2 million during the drought season and relative to the income from the 2016/17 season, the farming unit has lost R3.2 million. These results suggest that in many cases, even

though farmers tried to mitigate the impacts on production and minimised costs, significant losses were realised.

Table 4: Drought impact on a typical grape farm in LOR

Typical Grape Farm	Value in Rand ('000)		Drought Impact (Rand)
Income	**2016/17**	**2017/18**	
Wine Grapes (35 ha)	1 629.59	799.35	-830.25
Table Grapes (25 ha)	7 656.71	4 827.93	-2 828.78
Dried Grapes (10 ha)	732.32	906.56	174.23
Total Farm Income	10 018.63	6 533.83	-3 484.79
Expenditure	**2016/17**	**2017/18**	**Drought Impact (%)**
Fertiliser	269.76	180.12	-33.23
Chemicals	460.84	337.60	-26.74
Labour	1 955.70	1 851.21	-5.34
Electricity & Water	375.73	404.02	7.53
Cooling & Storing & Packaging	1 282.41	1 187.82	-7.38
Transport	496.51	312.25	-37.11
Marketing Cost	979.01	1 142.41	16.69
Other Costs	3 022.51	3 216.89	6.43
Total Expenditure	8 842.48	8 632.33	-2.38
Nett Farming Income	**1 176.15**	**-2 098.50**	**-R3 274.64**

Source: Own Compilation from research team

Not one farm is however the same and one should not interpret these findings across the wide spectrum of different types of farms. In order to get a sense of the impact of the drought on different farming enterprises, Table 5 shows the drought impact on a typical farm with the main focus on vegetable production, which also produces wine and dried grapes. Since farmers in this region produce tomatoes mainly for the factory in the area which did not open during the drought, this typical farm went from normally producing 2 000 tons of tomatoes to zero in 2017/18 and planting 4 hectares of vegetables, such as pumpkin, Brussel sprouts and dried beans, to none as a result of the drought. Wine production was also down by 35%, whilst the dried grapes delivered a good harvest despite the drought. Due to the lower output this typical farm only received R572 thousand income for produce compared to the R4.2 million in the 2016/17 season; a decline of R3.6 million.

On-farm management seeking to mitigate the financial losses resulted in total expenditure decline by 42% which is attributed to very limited use of seed, fertiliser and labour because no vegetables were planted. Again, water costs remained normal since this was outside of the control of the farmers in the region. The typical vegetable focussed farm given in Table 5 made financial losses of R1.8 million which is a significant shock to the businesses since debt had to be restructured to continue farming. Any marginal shock to a farming unit that has undergone such losses will ultimately lead to bankruptcy.

Table 5: Drought impact on a typical vegetable farm in LOR

Typical Grape Farm	Value in Rand ('000)		Drought Impact (Rand)
Income	**2016/17**	**2017/18**	
Tomatoes (20 ha)	3 326	-	-3 326
Wine Grapes (28 ha)	638	399	-239
Dried Grapes (3 ha)	69	163	93
Other vegetables (4 ha)	167	-	-167
Other Income	8	10	2
Total Farm Income	4 209	572	-3 637
Expenditure	**2016/17**	**2017/18**	**Drought Impact (%)**
Seed	438	11	-98
Fertiliser & Chemicals	985	290	-71
Labour	486	364	-25
Water	154	163	6
Electricity	189	173	-9
Transport	411	12	-97
Marketing Cost	7	1	-92
Other Costs	1 498	1 390	-7
Total Expenditure	4 168	2 403	-42
Nett Farming Income	**41.03**	**-1 831.32**	**-R1 872.35**

Source: Own Compilation from the research team

The two typical farm examples give a very clear indication of the different impact of the drought on different farming systems. The end-result however is the same; substantial financial losses in the short-run with additional medium term implications not even mentioned. Important to note in both of these examples is that the farmer will struggle to maintain production due to limited cash flow for the next few months due to restructured debt and continued lower payments from the cellars. Furthermore, the farmers in the region have cut back on key inputs to boost yields which might have a negative impact on next seasons' production and typically requires more spending on fertiliser and chemicals to get back to normal yield levels.

5.3 Drought Impact on jobs and livelihoods

One of the biggest concerns of the drought impact is the implications for agricultural jobs in the region. As noted previously, there are around 6 000 permanent labourers in the study area, whilst another 1 500 work in the region as seasonal labour for important months during the year. From the discussions with farmers it also became clear that the majority of them were forced to cut back on labour. The dominant strategy was to utilise a significantly smaller portion of seasonal labour, and in some severe cases had to lay off permanent staff. According to LGO (2018) the seasonal component of labour utilised was cut by more than 50% during the 2017/18 seasonal, whilst around 230 households of permanent workers lost their jobs. Additional to these mitigating strategies, some farmers also lowered the working hours of labourers and in many cases farmers tried to keep permanent labourers in service despite not having as much labour required due to the much lower yields.

A humanitarian forum was established to deal with the drought impacts at a social level, and the work-stream consisting of various government departments has provided support to farm workers. Some of the initiatives include the distribution of food hampers specifically targeted at seasonal labourers living within the region that lost their jobs. Furthermore, many of the permanent staff that lost their jobs have applied for payments from the Unemployment Insurance Fund (UIF) to support their families, hoping for re-employment if and when the demand for employment increases. The LGO has also been involved in fundraising activities to support communities in the region.

Decisions on labour usage during the drought have varied considerably based on mechanisation, the financial position of the farm and the specific intensivity of production. Based on the interviews with farmers and labour organisations, Table 6 summarises the macro-economic impact on farm workers in the study area. Aggregate declines in the wage bill between 2017/18 and 2016/17 are estimated at R49 million which has translated into around 257 permanent and 1 400 seasonal jobs losses during the drought. These job losses are particularly concerning as the wages normally provided by the agricultural sector ensures various welfare outcomes in the region. According to a recently published report by BFAP (2018), farmworker families spend on average anything between 21-29% of their household income on food. Based on various income sources, a household with two adult farmworkers is currently positioned in the 6th and 7th income bracket spread across ten income groups within South Africa. This highlights that, although farm workers receive relatively low wages, their livelihoods and ability to buy a balanced food basket for their families with the help of farmers' in-kind payments make a significant impact on their livelihoods. Without these wages and with very limited other employment opportunities, especially in rural setting such as the LOR, the humanitarian impact of the drought is far-reaching.

Table 6: Impact of the drought on farm workers

Type of Labour	Wage Bill 2016/17 (R million)	Number of workers	Labour Impact Assumption	Impact on farmworker's income (R million)
Permanent	170.70	5 121	6% decline: permanent work force	-8.58
Seasonal	54.52	1 636	75% decline: seasonal labour utilisation	-40.99
Total	225.23	6 756	Job losses: 257 permanent &1 400 seasonal	-49.57

Source: Own Compilation from the research team

5.4 Drought Impact on Input industries

Not only farmers have been significantly impacted by the drought, but their on-farm mitigating strategies have also meant much lower income to input businesses in the region. Discussions with suppliers in the region, and based on farmers' expenditure information, Table 7 summarises the aggregate impact on these industries. This is not an exhaustive list because it only includes some of the major industries. As noted in

the two typical farms many other industries such as marketing, transport, fuel, plastic and storage were impacted by the drought.

Looking at fertiliser, the estimated impact on gross income was a decline of 29% as farmers used less of this input. The seed industry, and particularly vegetable nurseries, were dramatically impacted losing around R14 million if one compares income from 2016/17 to 2017/18. Chemicals (27%), Marketing (16%), transport (21%) and electricity (17%) were all considerably lower compared to the 2016/17 season. Combining all the usage of inputs, these businesses incurred income losses of around R185 million. Recovery from these losses and possible business closure is only possible if the agricultural sector reaches normal production level as soon as possible. Without any interventions to boost farmers' cash flow challenges, these input suppliers will again be faced with lower than normal income for the coming season, even if water allocation returns to normal levels.

Table 7: Impact of the drought on selected input industries

Inputs	Gross Industry Value 2016/17 (R million)	Gross Industry Value 2017/18 (R million)	Drought Impact (%)
Fertiliser	69.73	49.17	-29.49
Seed	21.26	7.54	-64.56
Chemicals	66.96	48.80	-27.13
Marketing	8.04	6.76	-15.89
Mechanisation & Transport	145.64	114.61	-21.30
Electricity	52.04	43.03	-17.32
Total	363.67	269.90	-25.78

Source: Own Compilation from research team

6. Recommendations and Conclusion

The impact assessment conducted in this report has highlighted several important implications, for the agricultural sector specifically and more broadly for the economy of the LOR region. Both the agricultural and agri processing sectors play a significant role in creating economic opportunities and jobs and it is essential that the sector continues to do so. The 2017/18 drought has brought the farming community to its knees and its ability to recover from the financial losses is not by any means assured.

This report shows that farm output in the region has declined by 44% on average across the various agricultural industries, whilst input suppliers have suffered gross revenue losses of around R90 million. The economic impact on irrigation farms across the region show that the sector has lost R195 million in net farm income between 2016/17 and 2017/18. It has also been confirmed that the drought has resulted in

around 260 permanent jobs being lost, whilst an estimated 75% less seasonal labour was utilised during the drought. The farm-level analysis of two typical farms in the region reveals how different farming systems were impacted differently by the drought; both however lost several million rand in net income.

The interviews with various industry role players in the area, which included farmers, input suppliers, labour organisations and processing businesses, as well as the subsequent analysis, have highlighted three crucial elements to consider when developing interventions to the current disaster.

First, the financial losses incurred at farm-level are causing severe cash flow limitations on farmers to continue to buy much-needed inputs for the coming season. Many farmers have had to restructure debt and input suppliers in the area are concerned that farmers are not able to pay for the inputs they are requesting.

Second, both input providers and workers supplying labour on farms are dependent on a strong and quick recovery of agricultural production in LOR. Unless production levels normalise, farmers will not be able to re-employ the lost labour in the LOR and per definition will not have the resources to continually invest in their businesses. The latter point is specifically important in the current context of aging orchards and coping with additional damages as a result of the drought, in which case farmers should be spending more on inputs and re-establishment to ensure long-term competitiveness in markets.

Third, various sectors linked to farming (financial services, retailers, government, community institutions) are dependent on a healthy agricultural sector. For example the lower taxes paid in the region as well as lower use of electricity and financial services are putting additional pressure on government, as well as the entire society in the area. These three points are important factors to consider when both the type and extent of support be decided upon.

Based on the three elements presented above, the main recommendation from this report is to provide farmers with financial assistance that are both quick with very low transaction costs. Normal drought interventions to assist farmers (drought applications and strict selection criteria) could be time-consuming and difficult to process.

Since all irrigators in the study area faced exactly the same water restrictions, it could be sensible to reimburse farmers via the water management system by means of subsidising a proportion of water that was paid for, but never received during the drought. Such an arrangement will not discriminate against any individual's ability to mitigate the impact of the drought and also solves the scalability of drought support. Table 8 sets out a framework for such an initiative and gives the total value needed to provide drought support to the sector.

The listed hectares in the study area are 9 505 of which farmers pay LORWUA R3 600 per hectares. The official allocation per hectare which farmers expect to receive is 12 200 m^3/ha/annum which sets the price per m^3 at 0.295 cents. However, the long-term allocation has been declining over time with the actual allocation for the past 7 years before the drought being much lower at 9 875 m^3/ha/annum. Taking into account then the rest of the agricultural sector had 60% water restrictions across the Western Cape, a proposed subsidy price of 0.56 cent/m^3/ha is recommended and applied to each farmer's listed hectares. This is a combined area of 9 505 hectares across the LOR region. The proposed subsidy is valued at R52 935 908, to be made available to farmers in order to boost cash-flow and re-employ labour.

Table 8: Proposed intervention

Area and price of water	**Value**	**Unit**
Listed Hectares (LORWUA)	9505	Hectares
Price of water per hectare	R 3 600	Hectares/annum
Proposed intervention	**m^3/ha/annum**	**Price (c/m^3/annum)**
Official water allocation	12 200	0.295
Long term allocation (10 years)	9 875	0.365
Allocation 2017/18	2 325	1.548
Difference		1.184
Deviation from WC agriculture restrictions (60%)		0.48
Proposed subsidy per m^3		0.56
Proposed subsidy per listed hectare	9 875	5569.27
Total Proposed Subsidy		**R52 935 908**

Source: Own Compilation from research team

More detailed thinking is however needed to develop any proposed intervention, taking into account possible negative externalities that might arise. In conclusion then, the 2017/18 drought has affected the entire LOR region and particularly farmers and farmworkers. Decision makers should take care to understand the various negative long-term impacts of the drought and the widespread implications for the region.

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