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|---|---|---|---|---|
| | | | | X |

# FINAL REPORT 2022

**Winetech Number: IWBT W 20-01**

## 1. PROGRAMME & PROJECT LEADER INFORMATION

| | Research Organisation leader | Project leader |
|---|---|---|
| **Title, initials, surname** | Prof WJ du Toit | Dr HH Nieuwoudt |
| **Present position** | Head of Department | Senior Researcher (external) |
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## 2. PROJECT INFORMATION

| | |
|---|---|
| **Project title** | Sensory and Chemical insights on Low Alcohol wines |
| **Short title** | Sensory, chemistry, low alcohol wines |

| | | | |
|---|---|---|---|
| **Fruit kind(s)** | Wine Grapes | | |
| **Start date** (mm/yyyy) | 2020-01 | **End date** (mm/yyyy) | 2021-12 |

| | |
|---|---|
| **Key words** | |

| | CFPA | RAISIN SA | HORTGRO | SATI | WINETECH | ARC | OTHER |
|---|---|---|---|---|---|---|---|
| **TOTALS All years** | R 0 | R 0 | R 0 | R 0 | R 692750 | R 0 | R 0 |

| | |
|---|---|
| **Total cost of the entire project** | R 692750 |

## 3. EXECUTIVE SUMMARY

**Objectives and Rationale**
Driven by the growing economic importance of the de-alcoholised wine category, this project aimed to conduct an industry-wide assessment of the sensory quality of South African de-alcoholised wines and to generate their chemical profiles, with a focus on volatile aroma compounds.

**Methods**
Wine industry professionals evaluated the sensory quality of de-alcoholised wines in blind tastings using a 20-point scale and free listing for sensory descriptions. Chemical analysis involved GCMS-MS for volatile aroma compounds and HPLC/enzyme-linked spectrophotometry for non-volatile compounds. Data analysis included lemmatisation, correspondence analysis, and ANOVA.

**Key Results**
The overall quality of most still and sparkling de-alcoholised wines was assessed as average to below average, with panellists frequently identifying sensory faults, particularly in aroma and palate. Chemical analysis revealed unusually high levels of glycerol and markedly lowered ranges of volatile aroma compounds, especially esters, compared to typical full-strength wines.

**Key Conclusion of Discussion**
The findings highlight several technical challenges in de-alcoholised wine production that necessitate an industry-wide workshop. Critical aspects to address include the suitability of different grape cultivars, shelf life, optimal final alcohol concentration (0.5% or 0.05% v/v) for improved sensory quality, reconstitution strategies, and the potential addition of flavour compounds.

**Take Home Message for Industry**
To enhance the overall quality and market competitiveness of South African de-alcoholised wines, stringent sensory quality benchmark testing against high-quality local and international counterparts is imperative, along with understanding product intrinsics. This will guide product development and foster consumer confidence in this emerging category.

## 4. PROBLEM IDENTIFICATION AND MOTIVATION

### Problem Identification

Several physical techniques for reducing the ethanol (referred to as alcohol in this report) content in wine were developed in recent years. In South Africa, the low-alcohol product category is in its infancy, with SAWIS regulations for the various alcohol-content wine classes published as recently as 2020. This project focused on de-alcoholised wines, which, according to SAWIS, should have a maximum alcohol content of 0.5% v/v. Such large reductions in alcohol content, from ~12 % v/v in full-strength wines, are achieved by post-fermentation physical methods, including the spinning cone column (SCC) that utilises vacuum distillation

and removal of alcohol by membranes (nanofiltration and reverse osmosis). The technical challenges related to physical alcohol reduction in wine relate to the loss of volatile aroma compounds and, hence, altered sensory profiles in the final products.

Considering that a pleasant and palatable sensory profile is of major importance for consumers' willingness to purchase and repurchase a wine, the project's main aim was to obtain an industry-wide assessment of the perceived quality of a set of SA de-alcoholised wines to identify their sensory strengths and weaknesses. Since a wine's sensory profile is determined by its underlying chemical composition, the project also aimed to generate new knowledge on the volatile aroma composition of de-alcoholised wines.

**Motivation**

Consumers' demands for low-alcohol-content wines are an important driving force for the development of physical methods to reduce the alcohol content in wine. However, considering that a pleasant and palatable sensory profile is of major importance for consumers' willingness to purchase and repurchase a wine, insight into the perceived sensory quality of de-alcoholised wines is of clear economic significance for the SA wine industry. Moreover, this information, particularly the sensory strengths and weaknesses, is necessary for future quality improvements and product development. The de-alcoholised wine category is somewhat of a latecomer amongst other de-alcoholised beverages such as beer and gin, which are very successful in the market and popular amongst consumers. Therefore, the competitive positioning of de-alcoholised wines will require that consumers accept the wines. The SA de-alcoholised category is still very small in terms of different products, the number of producers and volumes produced. However, despite the small size, it is essential for the profitability of producing cellars to offer opportunities to develop new local and international markets.

## 5. ACCUMULATED PROGRESS TABLE

| Objectives | Milestones (Significant event or stage in a project) | Date Achieved |
|---|---|---|
| To construct a database of commercially available SA still and sparkling de-alcoholised wines (2019- 2020). | Completed and being updated with the overall results of sensory and chemical profiles. Database to be released in November 2022. | 2022-11-30 |
| To determine the sensory quality of de-alcoholised wines and identify the positive and negative sensory attributes of each wine. | Industry at-workplace sensory evaluation by 56 industry professionals of 23 wines (9 sparkling and 14 still) is completed. The number of cellars/suppliers in the Western Cape that participated = 9.<br>Text data mining completed. | 2021-10-31 |
| To do chemical | Aroma compound analysis by GCMS-MS completed. | 2022-11-30 |

| | | |
|---|---|---|
| profiling of the de-alcoholised wines, with a focus on aroma compounds | HPLC and enzyme robot analysis for fructose, glucose and glycerol completed. | |
| To do data interpretation and identify the factors with the most impact on the wine industry, in addition to the dissemination of results | All statistical analysis completed; dissemination of results to the industry role players and the wider industry has started. | 2022-10-31 |

## 6. WORKPLAN (MATERIALS AND METHODS)

**Wine selection and sensory panel recruitment:** SA de-alcoholised wines were searched online and selected based on their availability in retail stores. In total, 23 wines (9 sparkling and 14 still) were identified, and all were included in the project. Wines were subjected to chemical analysis using infrared spectroscopy to verify the alcohol content of a maximum 0.5% v/v. Ethical clearance for the sensory evaluation phase of the project was obtained from Social, Behavioural and Education Research (FESCAGRI-2020-14835), Stellenbosch University. The producing cellars were contacted by email and invited to participate in the sensory evaluation phase. The purpose of the evaluation, expected outcomes and sensory procedures that would be followed were explained in the correspondence. All the producing cellars accepted the invitation. In addition, one non-producing cellar requested to participate, and one non-producing wine research institution was also included. A total of nine industry at-workplace sites across the Western Cape were identified and participated in two separate sessions on different days, one day each for still and sparkling wines. Each cellar organised its own sensory panel and set up its own tasting venue. All the panellists agreed to participate in the study by signing a consent form. The demographics of the industry-wide panel were as follows: a total of 51 people participated, consisting of 23 females (age 23-61 years) and 28 males (26-64 years). Sufficient quantities of wine were obtained and stored in the university vinotique at 15 $^{o}$C until use.

**Sensory evaluation:** The research team (n = 4 members) managed the transport and pouring of the wines and officiated during the industry tastings. All COVID-19 regulations were adhered to, as stipulated by the South African Government (2020), for gatherings at the time when preparing and tasting wines. A tasting sheet was designed that detailed the tasks to be followed during the sensory evaluation. A hard copy of the sheet was provided to panellists so that they could compare the sensory quality of the different wines throughout the tasting. Standard blind wine sensory evaluation protocols were followed, whereby the brand name and producer were not disclosed until all panellists finished tasting. Still wines were tasted in two flights on one day, and sparkling wines in one flight. No repeats were done, and no training was given to the panel. Panellists were required to score the wines' quality out of 20 points, with separate marks allocated for the sensory modalities as follows: 3/20 for appearance, 7 out of 20 for aroma, and 10 out of 20 for palate. Overall quality was scored out of 20 points, the sum of appearance, aroma, and palate. Panellists were also required to describe their sensory perceptions for each of the modalities, using free-listing methodology.

**Statistical analysis of sensory data:** The quality scores obtained from panellists' scorecards were exported to Microsoft Excel® for processing and statistical analysis. Box-and-whisker plots were used to visualise the distribution of scores. The influence of factors other than wine quality on quality scoring was investigated and included the panellists' familiarity with the de-alcoholised wine style (either by producing the style or participating in tastings of de-alcoholised wines) and the individual panellist's job category (winemaker, wine marketing, quality control and research). Significance testing through ANOVA using the LSD test under mixed model ANOVA was done to investigate the influence of each modality on the overall quality scores.

Text data processing was done by firstly cleaning up the data (correcting grammar mistakes), followed by a standardisation process, whereby synonyms for the same descriptor were grouped into one term. In the subsequent lemmatisation process, the standardised sensory descriptors were grouped according to a set of rules designed based on the raw text data. For example, phrases generated by the panel "*Hints of browning"; "Browning colour";" Hints of brown"; "Slightly brown"* were grouped in one newly created category named **Brown tint.** In order to evaluate the incidence of positive and negative perceptions per wine, each category, per sensory modality, was then classified as either a positive, negative or neutral sensory attribute, as illustrated by the following examples: the category *Good Flavour* was classified as a positive attribute; the category *Brown Tint* as a negative sensory attribute and P*ale Yellow Colour* as a neutral attribute. Neutral attributes were not included in the positive/negative discriminant analysis.
The processed free listing data were exported to the TIBCO StatisticaTM Software Incorporated (Version 14.0.0.15) for statistical analysis of data. Citation frequencies, i.e., the number of times a specific sensory category was cited, were calculated per modality and used to construct citation frequency plots. These citations were used to construct a visual representation of the wine profiles, using word clouds. Additionally, correspondence analysis (CA) on the sensory categories cited at least 10 times was used to determine which category best described a specific wine.

**Chemical analysis:** Aroma compounds were extracted from the wines by a mixture of diethyl ether and 20% sodium chloride (NaCl). 4-methyl-2-pentanol was used as an internal standard. Extracted samples were analysed by GCMS-MS operated in selected reaction monitoring (SRM) mode. Samples were analysed in duplicate, and data acquired in the SRM function for quantification. Non-volatile parameters, D-glucose and D-fructose, were quantified by enzyme-linked spectrophotometric analysis, and glycerol by HPLC. Routine parameters pH and TA were quantified by the standard titration method,s and alcohol by infrared spectroscopy. Statistical analysis of chemical data was done as described for quantitative sensory data by distribution analysis and ANOVA testing.

## 7. RESULTS AND DISCUSSIONS

The details and physico-chemical profiles of the de-alcoholised sparkling and still wines used in this study are shown in Tables 1 and 2.

**Table 1. South African de-alcoholised sparkling wines (n=9).**

| Wine code | Grape Variety | Wine style | Ethanol (% v/v) | pH | TA (g/L) | Glycerol (g/L) |
|---|---|---|---|---|---|---|
| **W004** | Chardonnay | White | 0.5 | 3.45 | 6.20 | 15.8 |
| **W111** | Blend | White | 0.5 | 3.52 | 5.80 | 5.0 |
| **W017** | 100% Sauvignon Blanc | White | 0.2 | 3.42 | 6.60 | 16.1 |
| **W214** | Blend: 76% Pinot Noir 24% Chardonnay | White | 0.5 | 3.15 | 7.40 | 14.3 |
| **W429** | Blend: Sauvignon Blanc and White Muscadel | Sweet white | 0.5 | 3.34 | 6.03 | 19.4 |
| **W818** | 100% Sauvignon Blanc | Sweet white | 0.3 | 3.40 | 6.69 | 15.8 |
| **W566** | Blend | Rosé | 0.5 | 3.53 | 5.87 | 4.9 |
| **W736** | Blend | Semi-sweet rosé | 0.5 | 3.38 | 5.70 | 15.2 |
| **W916** | Blend | Sweet rosé | 0.3 | 3.27 | 5.74 | 20.2 |

**Table 2. South African de-alcoholised still wines used in the study (n=14).**

| Wine code | Grape Variety | Wine style | Ethanol (% v/v) | pH | TA (g/L) | Glycerol (g/L) |
|---|---|---|---|---|---|---|
| **W266** | Sauvignon Blanc | White | 0.5 | 3.72 | 6.20 | 14.4 |
| **W700** | Chenin Blanc | White | 0.5 | 3.42 | 5.7 | 13.9 |
| **W991** | Sauvignon Blanc | White | 0.2 | 3.51 | 4.8 | 14.3 |
| **W128** | Sauvignon Blanc | White | 0.5 | 3.11 | 5.6 | 3.5 |
| **W974** | Chenin Blanc | White | 0.4 | 3.40 | 5.2 | 3.8 |
| **W484** | Chenin Blanc, Muscat | Sweet white | 0.5 | 3.90 | 5.5 | 13.8 |
| **W530** | Blend | Rosé | 0.4 | 3.35 | 5.5 | 13.0 |
| **W716** | Pinotage, Muscat | Rosé | 0.4 | 3.38 | 5.5 | 13.0 |
| **W136** | Red Muscadel | Rosé | 0.4 | 3.10 | 6.2 | 2.9 |
| **W816** | Shiraz, Cabernet Sauvignon, Pinotage | Red | 0.5 | 3.91 | 4.8 | 15.7 |
| **W502** | Merlot | Red | 0.5 | 4.01 | 5.7 | 16.3 |
| **W330** | Shiraz | Red | 0.4 | 3.91 | 4.9 | 6.3 |
| **W8** | Merlot | Red | 0.5 | 3.73 | 5.8 | 6.1 |
| **W555** | Cinsaut, Cabernet Sauvignon | Red | 0.5 | 3.60 | 5.6 | 14.3 |

A noteworthy result of the routine wine chemical parameters relates to the glycerol concentration ranges of 4.89-20.20 g/L in the sparkling wines and 2.9-16.3 g/L in still wines. The glycerol concentrations in sparkling wines were reported to be below 10 g/L (Restani *et al*., 2007), while studies on SA dry white table wines reported ranges of 5.21-9.36 g/L (Nieuwoudt *et al*., 2002) and 4.55-11.68 g/L (Louw *et al.,* 2007). Therefore, the higher glycerol ranges observed in this study could be the result of the external addition of glycerol after de-alcoholisation, as permitted by SA wine regulation (SAWIS, 2020).

**Sensory quality evaluation of de-alcoholised wines**

The distribution of quality scores given by an industry-wide panel (n=52 panellists) for de-alcoholised sparkling wines. No significant differences between the scores given by panellists of producing versus non-producing cellars were found, nor between panellists of different job descriptions. It was concluded that the scores given were objective evaluations of the inherent quality of the wines in the blind tasting. Results shown in Table 3 showed that the overall quality scores given by 52 panellists on the 20-point scale ranged from 11.4 (W566) to 13.6 (W818) on the 20-point scale, with a maximum average score of 13.6. The appearance modality did not have much influence on the overall quality scores, because all wines scored above 2.5 out of 3. However, the aroma and palate modalities had a much higher impact on the overall low quality scores observed for the individual wines. For example, for aroma, several wines scored 1 or 2 points out of 7, with the maximum average value 4.6 out of 7 points (W818). For palate, several wines scored as low as 1 out of 10 points (W111, W566, W017, W818, W004, W214) and a maximum average of 6.1 out of 10 points

(W818).

**Table 3. Distribution of the average quality scores of de-alcoholised sparkling wine (n=9) tested. Overall quality scored out of 20, appearance out of 3, aroma out of 7 and palate out of 10 points.**

| Wine code | Overall quality (20) Ave (min-max) | Appearance (3) Ave (min-max) | Aroma (7) Ave (min-max) | Palate (10) Ave (min-max) |
|---|---|---|---|---|
| **W429** | 13.1 (8-18) | 2.7 (2-3) | 4.4 (2-7) | 6.0 (3-9) |
| **W916** | 12.6 (7-18) | 2.5 (0-3) | 4.2 (2-7) | 5.9 (3-9) |
| **W111** | 12.6 (4-17) | 2.7 (2-3) | 4.4 (1-6) | 5.5 (1-8) |
| **W566** | 11.4 (4-17) | 2.7 (1-3) | 3.8 (1-6) | 4.9 (1-8) |
| **W017** | 11.9 (4-17) | 2.8 (2-3) | 4.1 (1-7) | 5.1 (1-8) |
| **W818** | 13.6 (3-17) | 2.8 (1-3) | 4.6 (1-7) | 6.1 (1-8) |
| **W004** | 12.5 (5-17) | 2.7 (1-3) | 4.2 (1-6) | 5.6 (1-8) |
| **W736** | 13.2 (7-17) | 2.8 (1-3) | 4.4 (2-7) | 6.0 (3-9) |
| **W214** | 11.6 (3-16) | 2.6 (1-3) | 4.1 (1-6) | 4.9 (1-7) |

**Average (minimum- maximum)**

The outputs of the free listing data generated by the panel are shown in Table 4 and provide insight into the positive and negative sensory attributes that the panel members associated with the wines.

**Table 4. Output of free listing profiling of de-alcoholised sparkling wines (n=9)**

| Sensory modality | Raw data: total number of panel responses | Raw data: total number of wine descriptors used by the panel | Processed data: sensory categories identified | Processed data: number of positive sensory categories | Processed data: number of neutral sensory categories | Processed data: number of negative sensory categories |
|---|---|---|---|---|---|---|
| **Appearance** | 453 | 2414 | 10 | 5 | 0 | 5 |
| **Aroma** | 455 | 2110 | 29 | 3 | 23 | 3 |
| **Palate** | 457 | 3321 | 61 | 17 | 22 | 22 |
| **Total** | 1365 | 7845 | 100 | 25 | 45 | 30 |

The main results of the citation frequency analysis showed that for ***aroma***, the three main negative sensory categories (number of citations in brackets) were *off-odours* (n=110), *lacks aroma* (n=58) and *not wine-like aroma* (n=37). For positive attributes, the most frequently cited category was *good aroma* (n-43).

For **palate**, a large number of negative sensory categories were recorded, with the highest citation frequencies for *lacks flavour* (n=64), *short finish* (n=45), *acidic* (n=45), *unbalanced palate* (=38), watery (n=38), off-flavours (n=30) and *not wine-like flavours* (n=30).

**Aroma compound profiles**

Profiles of the volatile aroma compounds in the de-alcoholised wines were captured in a database for **esters** (ethyl acetate, isobutyl acetate, ethyl butyrate, 2-methylbutyl acetate, ethyl lactate acetate, and diethyl succinate), **higher alcohols** (2-phenylethanol, 1-butanol, 2-methyl-1-butanol, isoamyl alcohol, isobutanol), **volatile acids** (acetic acid, isobutyric acid, butyric acid, isovaleric acid, valeric acid, octanoic acid, decanoic acid) and **aldehydes** (trans-2-hexenal)**.** Since full-alcoholic strength wines were not used as controls in this study, no attempts were made to directly assess the effect of de-alcoholisation on the concentrations of aroma compounds. It is nevertheless interesting to compare the levels reported in this study to those of full-alcoholic strength wines. For both still and sparkling DEALC wines, a notable reduction in the concentration ranges for some esters (except for ethyl butyrate and ethyl lactate), and some higher alcohols (except 2-phenylethanol) was observed. Some of the findings are in agreement with published reports, although there is a dearth of information on de-alcoholised sparkling wines.

## 8. CONCLUSIONS AND RECOMMENDATIONS

The project was launched at a stage where the de-alcoholised wine category is still relatively new in South Africa. Detailed sensory profiles of the de-alcoholised wines were generated in the project, thereby offering deep insight into the strengths and weaknesses of the wines. Of concern was the large number of negative sensory attributes identified on the wines' aroma and palate, and this outcome calls for an industry-wide reconsideration of best practice strategies to maintain the original wine composition. The challenges translate into the questions, how to improve the quality of the wines, extend the shelf life and position de-alcoholised wines competitively in the low alcohol beverage industry in order to grow consumers' confidence in the products.

The results presented were generated on a small number of commercial wines of diverse styles, and no control wines (analysed prior to the alcohol reduction step) were available for analysis. Therefore, in terms of the volatile profiles, no direct link can be made between the final aroma composition and sensory profiles. Nevertheless, the de-alcoholised wines showed marked reductions in the concentrations of some groups of aroma compounds, notably esters, and it would be expected that the sensory profiles of the wines are also altered as a result. The effects ofthe removal of alcohol have profound and complex effects on the aroma of wine, and are influenced by a number of factors. These include the type of de-alcoholisation process, chemical-physical properties of the compounds (volatility, hydrophobicity), the retention effects of the non-volatile matrix on aroma compounds and the alcohol level (Longo et al., 2017).

## 9. PLANNED OUTPUTS

### a) TECHNOLOGY DEVELOPMENT, PRODUCTS AND PATENTS

No direct commercial value.

### b) SUGGESTIONS FOR TECHNOLOGY TRANSFER

None are planned.

### c) HUMAN RESOURCES DEVELOPMENT / TRAINING (STUDENTS)

| Student Name and Surname | Student Nationality | Degree (e.g., Hons, MSc) | Level of studies in the final year of the project | Total Bursary Cost for Industry for the entire project |
|---|---|---|---|---|
| **Honours** | | | | |
| 0 | | | | R 0 |
| **Masters** | | | | |
| Lethabo Maesela | RSA | MSc | Final | R 180000 |
| Sinazo Qwebani | RSA | MSc | Final | R 180000 |
| **PhD** | | | | |
| 0 | | | | R 0 |
| **Postdocs** | | | | |
| 0 | | | | R 0 |

### d) LIKELY PUBLICATIONS (POPULAR, PRESS RELEASES, SCIENTIFIC)

De-alcoholised wines: the good and the not so good – popular.

The fate of sensory attributes and volatile composition during alcohol content reduction - popular.

### e) PRESENTATIONS/PAPERS THAT COULD BE DELIVERED

Nieuwoudt, H. H. 24th Biennial SAAFoST Congress. Paradigm Shifts: Food in the 21st Century. Paradigm Shifts in Wine Sciences that relate to Changes in Flavour, Invited speaker presentation 20-22 September 2021. http://saafost2021.org.za/scientific-programme/

Nieuwoudt, HH, Low, lower, Zero. Unpacking de-alcoholised wines. Workshop presented at the

Ultimate Beverage Show, 27-29 January, 2022. Program attached.

Qwebani, S., Sensory aspects of de-alcoholised still wines. presentation at the Ultimate Beverage Show, 27-29 January, 2022.

Maesela, L. Sensory aspects of de-alcoholised sparkling wines.presentation at the Ultimate Beverage Show, 27-29 January, 2022.

## 10. PROJECT OUTCOME AND IMPACT

| New Knowledge | Benefits of the Supply Chain | Direct Grower Application | Direct Packhouse/Winery/ Cellar Application | Other |
|---|---|---|---|---|
| X | X | | | |

**Other is:**

**The Value of the project to the industry**

The project created new knowledge regarding the detrimental effects of alcohol content reduction by physical methods on the sensory quality and chemical composition of the wines.
The project outcomes call for an industry-wide technical workshop where all role players involved discuss technical challenges and quality-related issues.

## 11. PERSONS PARTICIPATING IN THE PROJECT:

| INITIALS AND SURNAME | HIGHEST QUALIFICATION | RACE (M, W) | GENDER (M, F) | INSTITUTE DEPARTMENT | POSITION | TOTAL COST TO PROJECT |
|---|---|---|---|---|---|---|
| **RESEARCH PERSONNEL** | | | | | | R 0 |
| N Muller | MSc | W | F | Food Science, US | Coll | R 0 |
| J Brand | PhD | W | F | DVO, US | Coll | R 0 |
| C Pentz | PhD | W | M | Business Management, US | Coll | R 0 |
| **SUPPORT PERSONNEL** | | | | | | R 0 |
| 0 | | | | | | R 0 |

POSITION: Co = Co-worker (other researcher at your institution)
Coll = Collaborator (participating researcher that does not receive funding for this project from industry)

PF = Post-doctoral fellow
PL = Project leader
RA = Research assistant
TA = Technical assistant/ technician

## 12. TOTAL COST OF PROJECT

| TOTAL ANNUAL COSTS (ALL YEARS) | CFPA | RAISIN SA | HORTGRO | SATI | WINETECH | ARC | OTHER | TOTAL |
|---|---|---|---|---|---|---|---|---|
| **2017** | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 |
| **2018** | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 |
| **2019** | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 |
| **2020** | R 0 | R 0 | R 0 | R 0 | R 512750 | R 0 | R 0 | R 512750 |
| **2021** | R 0 | R 0 | R 0 | R 0 | R 180000 | R 0 | R 0 | R 180000 |
| **2022** | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 | R 0 |
| **TOTAL** | R 0 | R 0 | R 0 | R 0 | R 692750 | R 0 | R 0 | R 692750 |