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Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam (WP0485)

Socio-Economic Impact Analysis Report






June 2021

POST FEASIBILITY BRIDGING STUDY FOR THE PROPOSED BULK CONVEYANCE INFRASTRUCTURE FROM THE RAISED CLANWILLIAM DAM

APPROVAL

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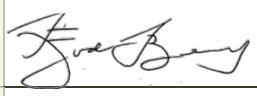
Author signature		Approver signature	
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DEPARTMENT OF WATER AND SANITATION

Directorate: Water Resource Development Planning

Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam

SOCIO-ECONOMIC IMPACT ANALYSIS REPORT

June 2021

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Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam

Reports produced as part of this project are indicated below.

Bold type indicates this report.

Report Index	Report Number	Report Title
1		Inception Report
2	P WMA 09/E10/00/0417/2	Capacity Building & Training Year 1
3	P WMA 09/E10/00/0417/3	Capacity Building & Training Year 2
4	P WMA 09/E10/00/0417/4	Water Requirements Assessment
5	P WMA 09/E10/00/0417/5	Distribution of Additional Available Water
6		Existing Infrastructure and Current Agricultural Development Sub-Report
7	P WMA 09/E10/00/0417/6	Existing Conveyance Infrastructure and Irrigated Land
8		Suitable Agricultural Areas and Land Ownership Report
9		Evaluation of Development Options Sub-Report
10	P WMA 09/E10/00/0417/10	Suitable Areas for Agricultural Development
11		Right Bank Canal Design Sub-Report
12		Conceptual Design Sub-Report
13		Environmental Screening Sub-Report
14		Jan Dissels and Ebenhaeser Schemes Design Sub-Report
15	P WMA 09/E10/00/0417/13	Feasibility Design
16	P WMA 09/E10/00/0417/7	Topographical Surveys
17	P WMA 09/E10/00/0417/8	Geotechnical Investigations
18	P WMA 09/E10/00/0417/9	Soil Survey
19		Financial Viability of Irrigation Farming Sub-Report
20	P WMA 09/E10/00/0417/11	Agricultural Production and Farm Development
21		Right Bank Canal Cost Analysis Sub-Report
22		Socio-Economic Impact Analysis Sub-Report
23	**P WMA 09/E10/00/0417/12**	**Socio-Economic Impact Analysis**
24	P WMA 09/E10/00/0417/14	Record of Implementation Decisions Report
25	P WMA 09/E10/00/0417/1	Main Report
26	P WMA 09/E10/00/0417/15	Historically Disadvantaged Farmers Report

Concise Description of the Content of Study Reports

Report Index	Report Number	Report Title and Description of Content
1		Inception The report forms part of the contract and stipulates the scope of work for the study, the contract amount and the contract period. It contains a detailed description of tasks and methodology, a study programme, human resource schedule, budget and deliverables. The Capacity Building and Training Plan has been included.
2	P WMA 09/E10/00/0417/2	Capacity Building & Training Year 1 Describes the range of capacity building and training activities planned for the study, and the activities undertaken during the first year of the study, including field-based training, training workshop 1 and mentorship of DWS interns through secondment.
3	P WMA 09/E10/00/0417/3	Capacity Building & Training Year 2 Describes the range of capacity building and training activities planned for the study, and the activities undertaken during the second year of the study, including field-based training, training workshop 2 and mentorship of DWS interns through secondment.
4	P WMA 09/E10/00/0417/4	Water Requirements Assessment Provides an analysis of the existing water use and current water allocations in the study area, and addresses ecological water requirements, water use for irrigated agriculture and projections for future use, current domestic and industrial water use and projections for future use, water use for hydropower and water losses in the water supply system.
5	P WMA 09/E10/00/0417/5	Distribution of Additional Available Water Confirms the volume of additional water available for development, after water has been reserved for the current water uses, as well as making recommendations on how the additional yield should be distributed among water use sectors and water users.
6		Existing Infrastructure and Current Agricultural Development Sub-Report Provides an overview of the extent and general condition of the current bulk water storage and conveyance infrastructure. This report also provides an overview of the locality and extent of the existing agricultural areas determined by reviewing Geographic Information System (GIS) data obtained from various sources.
7	P WMA 09/E10/00/0417/6	Existing Conveyance Infrastructure and Irrigated Land An update of the Sub-Report, providing a refinement of the current agricultural water requirements following evaluation of the current crop types, an assessment of the desirability of diverting releases for downstream irrigators via the Clanwilliam Canal and Jan Dissels River, to meet the summer ecological flows in the lower Jan Dissels River, and presents an Implementation Action Plan with costs.

Report Index	Report Number	Report Title and Description of Content
8		Suitable Agricultural Areas and Land Ownership Sub-Report Description of the collection of information and the preparation undertaken for the analysis of options, which includes a summary of existing irrigated areas and water use, cadastral information, land ownership, environmental sensitivity, soils suitability, water quality considerations and constraints, and the initiation of the process to identify additional areas suitable for irrigation.
9		Evaluation of Development Options Sub-Report Describes the salient features, costs and impacts of identified potential irrigation development options for new irrigation development in the lower Olifants River. This provides the background and an introduction to the discussions at the Options Screening Workshop held in December 2018.
10	P WMA 09/E10/00/0417/10	Suitable Areas for Agricultural Development Describes the supporting information, process followed and the salient features, costs and impacts of identified potential irrigation development options for new irrigation development in the lower Olifants River. Recommends the preferred options to be evaluated at feasibility level.
11		Right Bank Canal Feasibility Design Sub-Report Describes the Design Criteria Memorandum, based on best practice in engineering and complying with recognised codes and standards. Description of route alignments and salient features of the new Right Bank canal. Feasibility-level design of bulk infrastructure, including evaluation of capacities, hydraulic conditions, canal design, surface flow considerations, canal structures, power supply and access roads. Operational considerations and recommendations.
12		Conceptual Design Sub-Report Describes the scheme layouts at a conceptual level and infrastructure components to be designed, alternatives to consider or sub-options, and affected land and infrastructure, as well as the updated recommended schemes for new irrigation development.
13		Environmental Screening Sub-Report Describes and illustrates the opportunities and constraints, and potential ecological risks/impacts and recommendations for the short-listed bulk infrastructure development options at reconnaissance level. Describes relevant legislation that applies to the proposed irrigation developments.

Report Index	Report Number	Report Title and Description of Content
14		Jan Dissels and Ebenhaeser Schemes Feasibility Design Sub-Report Describes the Design Criteria Memorandum, based on best practice in engineering and complying with recognised codes and standards. Description of route alignments and salient features of the Jan Dissels and Ebenhaeser schemes. Feasibility-level design of bulk infrastructure, including evaluation of capacities, hydraulic conditions, intake structures, balancing dams and reservoirs, rising mains and gravity pipelines and trunk mains where relevant, power supply and access roads. Operational considerations and recommendations.
15	P WMA 09/E10/00/0417/13	Feasibility Design Description of the approach to and design of selected bulk infrastructure at feasibility level, with supporting plans and implementation recommendations.
16	P WMA 09/E10/00/0417/7	Topographical Surveys Describes the contour surveys for the proposed identified bulk infrastructure conveyance routes and development areas, the surveying approach, inputs and accuracy, as well as providing the survey information.
17	P WMA 09/E10/00/0417/8	Geotechnical Investigations Presents the findings of geotechnical investigations of the various identified sites, as well as the approach followed, field investigations and testing, laboratory testing, interpretation of findings and geotechnical recommendations.
18	P WMA 09/E10/00/0417/9	Soil Survey Describes the soil types, soil suitability and amelioration measures of the additional area covering about 10 300 ha of land lying between 60 to 100 m above river level, between the upper inundation of the raised Clanwilliam Dam and Klawer.
19		Financial Viability of Irrigation Farming Sub-Report Describes the findings of an evaluation of the financial viability of pre-identified crop-mixes, within study sub-regions, and advises on the desirability of specific crops to be grown in these sub-regions. It includes an evaluation of the financial viability of existing irrigation farming or expanding irrigation farming, as well as the identification of factors that may be obstructive for new entrants from historically disadvantaged communities.
20	P WMA 09/E10/00/0417/11	Agricultural Production and Farm Development This report will focus on policy, institutional arrangements, available legal and administrative mechanisms as well as the proposed classes of water users and the needs of each. This would include identifying opportunities for emerging farmers, including grant and other types of Government and private support, and a recommendation on the various options and opportunities that exist to ensure that land reform and water allocation reform will take place through the project implementation.

Report Index	Report Number	Report Title and Description of Content
21		Right Bank Canal Cost Analysis Sub-Report Provides an economic modelling approach to quantify the risk of the failure of the existing main canal and the determination of the economic viability of the construction of the new right bank canal to reduce the risk of water supply failure.
22		Socio-Economic Impact Analysis Sub-Report Describes the socio-economic impact analysis undertaken for the implementation of the new irrigation development schemes, for both the construction and operational phases. This includes a description of the social and economic contributions, the return on capital investment, as well as the findings of a fiscal impact analysis.
23	P WMA 09/E10/00/0417/12	Socio-Economic Impact Analysis Synthesis of agricultural economic and socio-economic analyses undertaken, providing an integrated description of agricultural production and farm development and socio-economic impact analysis, as well as the analysis of the right bank canal costs and benefits.
24	P WMA 09/E10/00/0417/14	Record of Implementation Decisions Describes the scope of the project, the specific configuration of the schemes to be implemented, the required implementation timelines, required institutional arrangements and the required environmental and other approval requirements and mitigation measures, to ensure that the project is ready for implementation.
25	P WMA 09/E10/00/0417/1	Main Report Provides a synthesis of approaches, results and findings from the supporting study tasks and interpretation thereof, culminating in the study recommendations. Provides information in support of the project funding motivation to be provided to National Treasury.
26	P WMA 09/E10/00/0417/15	Historically Disadvantaged Farmers Report Describes the activities undertaken by an independent consultant to evaluate existing HDI Farmers policies and legislative context, identify, map and analyse prospective HDI farmers and potential land for new irrigation, as well as propose a mechanism for the identification and screening of HDI farmers.

Executive Summary

Introduction and Background

The objective of the *Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam* is to provide recommendations on the bulk conveyance infrastructure required for the equitable distribution of the existing and additional water from the raised Clanwilliam Dam. The additional water will be used to meet the ecological water requirements of the Olifants River, provide irrigation water to existing irrigators at a higher level of assurance and new irrigators and most importantly support historically disadvantaged farming projects and other broad-based black economic empowerment opportunities.

This report is a synthesis of the agricultural economic and socio-economic analyses undertaken, providing an integrated description of agricultural production and farm development and socio-economic impact analysis, the analysis of the right bank canal costs and benefits. It incorporates the analysis and main conclusions of the reports in **Table E1** below.

Table E1: Reports Informing the Socio-Economic Impact Analysis Report

Report Index	Report Number	Report Title
19	-	Financial Viability of Irrigation Farming Sub-Report
20	P WMA 09/E10/00/0417/11	Agricultural Production and Farm Development
21	-	Right Bank Canal Cost Analysis Sub-Report
22	-	Socio-Economic Impact Analysis Sub-Report
23	P WMA 09/E10/00/0417/12	Socio-Economic Impact Analysis

To motivate the significant investment required for the raised Clanwilliam Dam and bulk conveyance infrastructure, it needs to be determined whether the water use could be motivated from an economic, socio-economic and policy perspective. The bulk of the investment would need to be allocated from the Fiscus, and hence the return on investment needs to be justified by the water use.

Analyses were therefore undertaken to determine the financial viability of irrigation farming and the benefits from an economic and socio-economic perspective. It is important that the water would be allocated to benefit historically disadvantaged individuals (HDIs). For this purpose, the proposed farming models, needs analysis of smallholder farmers, case studies, and relevant

conclusions from the *Agricultural Production and Farm Development Report* (Department of Water and Sanitation (DWS), 2020) were also included in this report. A balance needs to be found between commercial sustainability on the one hand, and the needs of HDIs and destitute communities on the other. Both objectives need to be met to obtain approval from all relevant Government Departments and ultimately to motivate for the funding of the scheme.

Financial Viability of Irrigation Farming

The evaluation of the financial viability of irrigation farming for various commercial-scale options and smallholders determined that the crops that are best suited for the areas identified for development are as shown in **Table E2** below.

Table E2: Identified Irrigation Zones and Suitable Crops

Zone	Location	Suitable Crops
1	Citrusdal, upstream of Clanwilliam Dam	• Citrus (oranges & soft citrus)
2	From Clanwilliam Dam Wall to Bulshoek Weir (including Jan Dissels River)	• Citrus (oranges & soft citrus) • Table Grapes • Potatoes / wheat in rotation
3	Jakkalsvlei / Graafwater	• Potatoes • Grazing
4	From Bulshoek Weir to Trawal	• Table grapes • Raisins • Wine grapes • Tomatoes / brassica seed in rotation
5	From Trawal to the Coast	• Table grapes • Raisins • Wine grapes • Tomatoes / brassica seed in rotation

The minimum viable farm sizes resulting from the financial evaluations undertaken are presented in **Table E3** below, according to the identified commodities. The minimum viable farm size for a typical existing farm was calculated, as well as the minimum viable farm size for a new black-owned farm, where the land was obtained at no cost.

Table E3: Minimum Viable Farm Sizes

Crop	Existing Commercial (ha)	New Black Owned (JV model) (ha)
Citrus	22	90(@IRR 8%)
Table Grapes	16	46 (@IRR > 9.25%)
Wine Grapes	Not currently viable	Not currently viable
Raisins	68/12	26 (@IRR > 9.25%)
Tomatoes/Brassica seed - commercial	27	41 (@IRR > 9.25%)
Tomatoes/Brassica seed - small scale production	6	6 (@IRR > 9.25%)

The following important notes relating to the values in **Table E3** should be considered:

- The minimum viable farm size was determined by reducing the area (hectares) in the financial model to such a point that the real Internal Rate of Return (IRR) remains above 9.25%,
- The IRR for New Black-Owned citrus farms is 8% instead of 9.25% to keep the farm size reasonable, slightly reducing the 5% risk allowed for. The capital requirement to establish a new farming venture and the overhead costs of running a commercial farm are high in relation to the farm's productive value, particularly given the time it takes for new plantings of perennial crops to come into full production,
- For raisins, the minimum viable farm size of 68 ha is based on the current average yield of 22 ton/ha, while the 12-ha farm size was calculated at a yield of 50 ton/ha based on top varieties and best practice.

In general, the development of new irrigation farms seems to be challenging from a financial viability perspective. Given the reality of relatively profitable existing farming operations in the various regions of the study area, the major contributing factor to lower profit margins seem to be the expected relatively high capital cost of the development of new farms and the time taken for new plantings to come into full production.

It is therefore important to note that the expansion of existing irrigation farms will in general be financially more viable than the development of new irrigation farms. The main reasons for this are the cost effectiveness of the improved utilisation of infrastructure on existing farms relative to the costly nature of the development of new farms. For expansion of existing farms, citrus and table grapes currently appear to be profitable, followed by the other crops under certain circumstances.

Based on the financial evaluations, the following deductions have been made, which were considered when evaluating options:

1. Irrigation farming is capital intensive and costly due to, *inter-alia*, the following:
    - High-potential irrigation land is relatively scarce and is therefore expensive;
    - The upgrading of medium-low and medium potential irrigation soil is a relatively expensive activity;
    - The upgrading and development of bulk water infrastructure for irrigation is capital-intensive and is therefore costly;
    - On-farm water infrastructure is also costly; and
    - The establishment costs for new orchards/vineyards are high.
2. To produce a high income and offset the high capital- and other costs, high-value crops are produced, predominantly for export markets. These high-value crops however require a high level of technological and managerial inputs, making it difficult for new market entrants. For instance, the financial viability models for new black-owned farms and small-scale commercial farms are based on the yields that commercial growers achieve, but it cannot be assumed that all new black-owned farms will achieve these yields.

The financial viability evaluation also investigated whether agricultural production could be profitable for smallholder (7.5 ha farms, of which 6 ha is considered to be irrigable) and commercial water users.

From a commercial perspective, the large-scale production of citrus and table grapes by HDIs on new farms could be profitable in the study area if land is provided at no cost. A possibility exists to develop areas such as the lower Jan Dissels River and the Zypherfontein irrigable areas to produce these crops at scale. Raisins, tomatoes, and wheat could also be profitable if high yields are produced.

From a smallholder farming perspective, it was found that a 6 ha agricultural unit in Ebenhaeser could potentially provide the farmer with an income of over R 8 000 per month, if irrigation infrastructure and implements are covered by grants and the growers possess the inputs, skills, and expertise to produce commercial-grade yields. It has been assumed that these farmers will only be liable for a very small portion of the total water levy. This finding could also be extrapolated to other areas that may be able to receive new water allocations, e.g., municipal commonage schemes or other peri-urban or subsistence farming operations, should they similarly be exempt of paying full levies.

Socio-economic Impact Analysis

An analysis was undertaken to evaluate the relevant impacts that could emerge because of the implementation of the full suite of recommended schemes. The socio-economic impact was separately undertaken for the construction and operational periods.

The benefits of the short-term construction phase impacts for the area will be significant.

Operational Phase Results – New Irrigation Area

Findings from the Operational Phase Impacts indicate that the total Gross Domestic Product (GDP) for development of the new irrigation areas is estimated to be R 2 674 million per annum (expressed in 2018 prices). The operational activities will create a total of R 4 894 million new capital annually, which is an important driver of economic growth. In total, an estimated 15 031 job opportunities can be created and supported per annum of which 10 924 in the direct category will be in the area and on the farms.

One of the crucial aspects of any socio-economic impact assessment is poverty alleviation. The extent to which poverty alleviation is achieved is measured by the impact on household income, specifically the extent to which low-income households will be affected by the additional water provided following the raising of Clanwilliam Dam. In total, the annual impact of the expected wages to be paid to the households is an estimated total of R 2 131 million annually, expressed in 2018 prices, of which 14% is to low-income households, at an average income of R 3 500 per month.

Government income (taxes, etc.) will increase, on average, by R 766 million per annum. If this amount is translated into social services, by using the social expenditure portion of the current budget, it also produces increases in other social services.

Operational Phase Results – Existing Area with Improved Assurance of Supply

The benefits to the Provincial and National Government from the increased assurance of supply to be provided to the present producers are:

- Total average GDP increase – R 601 million per annum;
- Number of jobs secured – 4 611. This is people that will have a higher job security;
- Average Increase in Household Income – R 650 million per annum;
- Fiscal Impact - R 171 million per annum; and
- Average annual stabilising impact of the increase in Balance of Payments is R 328 million.

The analysis undertaken indicates that the productive use of the additional water from the raised Clanwilliam Dam, inclusive of the increased assurance of supply will have a substantial positive

impact on the social and economic conditions prevailing in the area, and that this will lead to substantial poverty alleviation in the area.

Right Bank Canal Scheme Cost Analysis

This financial and socio-economic evaluation aimed to quantify the risks and implications of failure of the existing left bank main canal, to provide additional motivation for the betterment cost component of the Right Bank Canal Scheme. The costs and benefits associated with the construction of the Right Bank Canal Scheme were compared with the alternative scenario, should the scheme not be built. The latter alternative is the development of two small bulk water schemes to supply the four recommended new Trawal irrigation areas, and refurbishment of the remainder of the current main canal on the left bank.

A cost benefit assessment was done to determine the economic viability of the proposed construction over the long term, while a macro-economic impact assessment was employed to assess its socio-economic impacts. From a capital cost point of view, the costs of the two alternatives for the main canal are effectively the same, although implementation of production areas would differ.

It is estimated that the total loss of income at farm level over two years, resulting from a canal break could be in the region of R 1.2 billion for a 30-day water cut and R 1.5 billion for a 3-month water cut. At earnings before interest, tax, depreciations, and amortisation (EBITDA) level, the losses are estimated at R 674 million and R 865 million, respectively.

The development and betterment costs for the two long term scenarios are presented in **Table E4**. Note that the development component is the same for both scenarios below, as it has been assumed to be equal to the cost of the two small schemes to supply the four new Trawal irrigation areas. Should the Right Bank Canal not be constructed however, the two small supply schemes would instead be constructed.

Table E4: Development and Betterment costs of the two development scenarios

Main canal long-term alternative	Development Component	Betterment Component	Total Cost	Construction Period
Two small supply schemes and upgrading of left bank main canal	R 573.16	R 1 436.41	R 2 009.57	18 years
Right Bank Canal Scheme	R 573.16	R 1 421.50	R 1 994.66	4 Years

It is estimated that the right bank canal will be constructed over a 4-year period. The alternative two small water supply schemes will be constructed over 3 years and the betterment of the remainder of the existing left bank main canal will be implemented over a 15-year period.

The evaluation of social and economic conditions in the Cederberg and Matzikama Local Municipalities indicates that the future growth of the economy of the two municipalities will depend on increased irrigation.

The comparative evaluation of the two development scenarios indicates that the Right Bank Canal Scenario is preferable in terms of the benefits of the baseline cost benefit analysis, although both development scenarios show viable benefits. The Right Bank Canal Scenario presents the stronger financial and economic benefits.

A detailed risk and sensitivity analysis was also performed, for some of the cost items that might increase faster than the projected inflation rate, as well as the possibility that projected income levels may not be attained. The benefits show that both scenarios provided positive answers if no impact of the existing areas are taken into consideration, but the benefits of the Alternate Left Bank Canal Scenario are considerably lower than the benefits from the Right Bank Canal Scenario. The second comparison indicates that, if the financial benefits are lower than 15% of the expected benefits, then the Alternate Left Bank Canal Scenario is not viable.

The financial and economic viability analysis undertaken supports the recommendation that the Right Bank Canal is the preferred long term development scenario for the main canal. Significant benefits have been identified for the construction of the Right Bank Canal Scheme, in comparison with the alternative development scenario. It is concluded that the recommended decision to include a ‘Betterment’ cost component for the scheme will have a positive socio-economic impact on the area and is strongly recommended.

Agricultural Production and Farm Development Analysis

The main objective of this investigation was to provide clarity on the proposed farming models related to the uptake of additional irrigation water. In terms of the principle of Water Allocation Reform (WAR), preference should be given to HDIs when the allocation of water is considered. The farming models were developed with this principle in mind. Furthermore, a needs analysis of HDI farmers was done, focusing on the agricultural value chain. This report also includes case studies of both land restitution cases and successful commercial Joint Venture (JV) projects.

The *Land Reform Panel Report*[1] discusses the viability of various land reform farming models that should be considered. The analysis is done from the perspective of the landowner, namely public

[1] Advisory Panel on Land Reform and Agriculture, 2019

land, private land, commonage land or land owned by a community. The viability of farming models in respect of these land ownership structures were investigated. The specific models are unpacked further in **Table E5** below, indicating the land ownership, best application, and viability of each.

Table E5: Merits and Viability of Different Land Reform Models

#	Model name	Land ownership	Best application	Viability
1	Group operations on communal land	HDI community	Protecting land ownership for HDI communities	Viable for communal grazing. Large scale operations viable if secure long-term leases are in place
2	Individual smallholder farmers on land owned by Government	Government	Proactive Land Acquisition Strategy (PLAS) projects	Not viable - leaseholders rarely get ownership
3	Individual smallholder farmers on land not owned by Government	HDI farmers / non-HDI farmers	HDI farmers to lease land from non-HDI farmers	Highly viable for both small- and large-scale commercial farms
4	Individual commercial operations on land not owned by Government	HDI farmers / non-HDI farmers	Commercial operations	Highly viable for both small- and large-scale commercial farms

In the *Agricultural Production and Farm Development Report* (DWS, 2020), various "**best approach options**" are recommended for the uptake of water and development of the study area. Strategic partnership / mentorship agreements with the commercial sector should *inter-alia* be in place, to ensure that the whole value chain is serviced to ensure high yields, competitive prices, and a secure off-take of crops. The way that the strategic partner or mentor derives benefit from the project should be scrutinised, to ensure that no exorbitant fees are charged, and that project income reaches the communities. It may be possible for the Citrus and/or Table Grape industry to provide a commitment to such projects, where they in turn receive the fruit produced to be marketed. Although small farm sizes have not been found to be financially viable, a productive unit of 6 ha could provide a family with a basic income (e.g., the income of R 96 000 p/a for a small vegetable growing unit).

If **strategic partnerships or JVs** are to be undertaken it is important that the suitable group size be chosen. From experience, the size of the group has been found to be a significant factor of likely success of a project (the larger the group, the less chance of success in general). Further success factors for JVs require that the strategic partner remains accountable to the project and that the HDIs in the project are involved in the management thereof and enjoy a degree of upskilling, both in terms of technical expertise and in terms of management capabilities.

In addition to the above, support would be needed from the Department of Agriculture, Land Reform and Rural Development (DALRRD) in terms of the Comprehensive Agriculture Support Programme (CASP), from industry bodies, from DWS in terms of Resource-Poor Farmer Assistance, and from DALRRD in terms of the One Household-One Hectare Project and the Agri-Parks project. It needs to be determined whether these programmes still hold the capacity to undertake an irrigation project at scale.

Private development refers to commercial development with a black-owned counterpart (51-100% black-owned). This was recommended as the most feasible development option in the *Feasibility Study for the Raising of Clanwilliam Dam*[2] and this has been confirmed. Private development was also identified as the most feasible option in terms of the *Land Reform Panel Report.*[3]

The recommendation per preferred irrigation development scheme is indicated in **Table E6** below.

Table E6: Recommended development per preferred irrigation scheme

Scheme	Hectares	Recommended type of development
Jan Dissels	462	GWS consisting of a combination of commercial farmers and smallholders on state land. Ideal for smallholder development, being located very close to Clanwilliam Town. Proposed 50% smallholder development.
Clanwilliam	341	Private land. Combination of JVs and potentially smallholder farmers.
Zandrug	1 119	Private land. Combination of JVs and potentially smallholder farmers.
Bulshoek	266	Private land. Combination of JVs and potentially smallholder farmers.
Right Bank Canal: Zypherfontein 1 Zypherfontein 2 Melkboom Trawal	 710 614 301 510	Private land. Combination of JVs and potentially smallholder farmers. Located in the Trawal area, one or more of these areas can potentially be considered for a GWS, in combination with the construction of a new Right Bank canal.
Klawer Phase 1 Klawer Phase 2	412 438	Private land. Combination of JVs and potentially smallholder farmers. Private land. Combination of JVs and potentially smallholder farmers, in combination with the construction of a new Klawer Canal.
Coastal 1	93	Private land. Combination of JVs and potentially smallholder farmers.
Ebenhaeser	312	63 Ha of Smallholder development and 250 ha for restitution farms (with 12 000 m^3/a allocations).

Note: 'JVs' in the table above can potentially include the option of black commercial farmers purchasing private land.

[2] DWS, 2007
[3] Advisory Panel of Land Reform and Agriculture, 2019

The Jan Dissels and Ebenhaeser schemes could ensure the development of about 5% of the total new development for smallholder farmers. Should the Trawal GWS be considered, this will provide a significant opportunity for the development of an additional 5% for smallholder farmers. The development of private land could alternatively be implemented with the premise that a few smaller agricultural units be farmed together under a central mentoring agent, i.e., the JV or black commercial farmer, to meet Government policy for "'quick wins" through smaller agricultural units.

Conclusions

Key conclusions are presented below.

Financial Viability of Irrigation Farming

The expansion of existing irrigation farms will in general be financially more viable than the development of new irrigation farms. For expansion of existing farms, citrus and table grapes appear to be profitable. The other crops that were investigated are only deemed profitable in

Socio-economic Impact Assessment

The socio-economic impact analysis undertaken for the use of incremental water availability from a raised Clanwilliam Dam, supports the development motivation, as such development will have a substantial positive impact on the social and economic conditions prevailing in the area, and significantly alleviate poverty in the area.

Right Bank Canal Scheme Cost Analysis

The Right Bank Canal Scheme provides a unique opportunity to combine long-delayed betterment works more cost-effectively with new development infrastructure. The opportunity to piggy-back onto the new development is a once-off. If missed, that opportunity will be foregone. The scheme will significantly reduce the risk of canal breakage and supply interruptions to water users, lower water losses, lower the risk of damage to the regional economy, provide opportunity for improved irrigation to existing users and allow for future water provision.

Agricultural Production and Farm Development Analysis

Should the economic and socio-economic benefits of the scheme be realised, equity objectives need to be aligned with the objectives of commercial viability. For this purpose, the commercial JV model with a shared ownership has been found to be the most feasible option, given that it makes provision for black ownership, and could be commercially viable if the correct safeguards are in place.

Development of smaller agricultural units have not been found to be commercially viable, and communal land ownership also has many pitfalls. It should however be noted that further study may be needed into the feasibility of schemes for smaller agricultural plots, as the financial viability thereof could not be established within the ambit of this current study.

Contents

Figures

Tables

Abbreviations and Acronyms

BCR	Benefit cost ratio
CASP	Comprehensive Agricultural Support Programme
CBA	Critical biodiversity area
CBAn	Cost Benefit Analysis
CLM	Cederberg Local Municipality
CPA	Community property association
CPAC	Commodity Project Allocation Committee
CPI	Consumer price index
DCF	Discounted Cash Flow
DALRRD	Department of Agriculture, Land Reform and Rural Development
DAFF	(Previous) Department of Agriculture, Forestry and Fisheries
DPAC	Departmental Project Allocation Committee
DRDLR	Department of Rural Development and Land Reform
DWAF	(Previous) Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EBITDA	Earnings before interest, tax, depreciations and amortisation
ECBA	Economic cost benefit analysis
FCBA	Financial cost benefit analysis
FTE	Full-time equivalent
GDP	Gross domestic product
GIS	Geographical information system
GWS	Government water scheme
Ha	Hectare
HD	Historically disadvantaged
HDF	Historically disadvantaged farmer
HDI	Historically disadvantaged individual
IRR	Internal rate of return
JV	Joint venture
MAIFSA	Micro Agricultural Financial Institutes of South Africa
MEIA	Macroeconomic impacts assessment
MLM	Matzikama Local Municipality

NPV	Net present value
NWA	National Water Act
LORGWS	Lower Olifants River Government Water Scheme
O&M	Operation and maintenance
PLAS	Proactive Land Acquisition Strategy
PV	Present value
SAM	Social accounting matrix
SATI	South African table grape industry
SAWIS	South African wine industry statistics
SIZA	Sustainability Institute of South Africa
TOR	Terms of reference
URV	Unit reference value
VAT	Value added tax
WAR	Water allocation reform
WCDoA	Western Cape Provincial Department of Agriculture
WRC	Water Research Commission
WUA	Water user association

Glossary

Assurance of supply: The reliability at which a specified quantity of water can be provided, usually expressed either as a percentage or as a risk. For example, "98% reliability" means that, over a long period of time, the specified quantity of water can be supplied for 98% of the time, and less for the remaining 2%. Alternatively, this situation may be described as a "1 in 50-year risk of failure" meaning that, on average, the specified quantity of water will fail to be provided in 1 year in 50 years, or 2% of the time. The higher the assurance of supply, the less often there will be an annual shortage of supply.

Balance of Payments: The balance of payments (BOP) is a statement of all transactions made between entities in one country and the rest of the world over a defined period.

BCR (Benefit Cost Ratio): Is calculated within the construct of the following formula: Benefits/Cost.

Betterment cost: The cost relating to the rehabilitation or improvement of a water supply system or scheme that will benefit existing water users.

Capital cost: Fixed, one-time expenses incurred on the purchase of land, buildings, construction, and equipment used in the production of goods or in the rendering of services.

Capital Formation: Capital formation is a crucial element for economic growth. Capital formation increases investment, which stimulates economic development.

Commercial Farming: Large scale farming, the products of which are normally sold for profit. Also referred to as a *Commercial Enterprise*.

Cost Benefit Analysis: A Cost Benefit Analysis (CBA) is used to calculate the micro-economic feasibility of the project by comparing the costs and benefits and thereby establish the financial and economic viability of the project.

Direct Impact: Impact created in the project area where the capital is spent, or production is generated.

Discount Rate: Is the rate used to convert current Rand values of costs which occur in a future year to a present value in the base year. The recommended inflation free rate is *r*. To convert an amount which will be paid *n* years in the future to a present value, divide the future value by $(1+r)^n$. Discount rates can be reflected in real or nominal terms where ‘real’ indicates that the effects of general inflation have been removed. The discount rate used depends on the type of Rands to be adjusted. Discounting translates projected cash flows into present value terms using specified discount factors.

Emerging farmer: Middle class of mostly black smallholder farmer, between the subsistence orientated smallholder farmer that farms to meet household food security, and the fully commercial orientated smallholder farmer, whose objective is to sell produce.

Gross Domestic Product (GDP): A monetary measure of the market value of all the final goods and services produced in a specific time, often annually, within a specific country.

Historically disadvantaged farmers: Farmers who come from previously disadvantaged groups. This includes certain race groups, women, youth and people with disabilities. Used interchangeably with resource-poor farmers.

Historically disadvantaged individual: A South African citizen who, due to the apartheid policy that had been in place, had no franchise in national elections prior to the introduction of the Constitution of the Republic of South Africa, 1983 (Act 110 of 1983) or the Constitution of the Republic of South Africa, 1993 (Act 200 of 1993); and/or who is a female, and/or who has a disability, provided that a person who obtained South African citizenship on or after the coming into effect of the interim Constitution, is deemed not to be an HDI.

Indirect Impact: Impact created by input service providers and could occur in the project area or outside as part of the marketing of the products.

Induced Impact: Impact generated by the salaries and wages paid and the spending of this income.

Intermediate Costs: Intermediate costs constitute the total monetary value of goods and services consumed or used up as inputs in production by enterprises, including raw materials, components, services, and various other operating expenses.

Joint venture: a business arrangement in which two or more parties agree to pool their resources for the purpose of accomplishing a specific task.

IRR (Internal Rate of Return): Is the discount rate that sets the net present value of the programme or project to zero. While the internal rate of return does not generally provide an acceptable decision criterion, it does provide useful information, particularly when budgets are constrained or there is uncertainty about the appropriate discount rate.

NPV (Net Present Value): Is defined as the difference between the present value of benefits and the present value of costs. The benefits referred to in this calculation must be quantified in monetary terms to be included.

Options analysis: The practice of evaluating every possible pathway that leads to a desired outcome. In water resources development, it is the analytical process to identify intervention options (development schemes and other measures), evaluate and compare them, and screen them to arrive at a short list of preferred options or the preferred option.

Partial Equilibrium: Partial equilibrium is a condition of economic equilibrium that takes into consideration only a part of the market (assuming all other parts of the market remain constant) to attain equilibrium.

Permanent Equivalents: Direct labour on the farm is expressed in "permanent equivalents" in the case of temporary labour, i.e., if a worker is temporarily employed for 3 months per annum, (s)he is classified as 0.25 permanent equivalent.

Restitution farms: Farms handed to successful claimants for restitution for land, in terms of the Restitution of Land Rights Act. It involves the restitution of land to individuals and communities who lost their homes and land due to forced removals.

Smallholder farmer: A producer that also farms for subsistence, typically producing one or two cash crops. These producers have the potential to produce for the market at profit in the long term but often lack the infrastructure and technology that more developed farming enterprises have.

Social Accounting Matrix (SAM): A SAM is a comprehensive, economy-wide database that contains information about the flow of resources that take place between the different economic agents that exist within an economy. The SAM forms the basis of the model to calculate socio-economic impacts of the project.

Subsistence farmer: Someone that produces primarily for consumption at a household level and usually employs family labour.

Water user association: Water user associations are formal organisations created to bring together farmers for the purpose of managing a shared irrigation system, although it generally includes water supply to other water users.

1 Introduction

1.1 Project Background

The Clanwilliam Dam is situated on the Olifants River near the town of Clanwilliam in the Olifants/Doorn River Catchment Management Area in the Western Cape. The dam requires remedial work for safety reasons, which in turn offers the opportunity for the farming activity to increase the yield by raising the dam wall and enlarging the storage capacity. Water use in the region is predominantly for irrigated agriculture.

A feasibility study was completed in 2008, which concluded that the raising of Clanwilliam Dam and further associated agricultural development is economically viable and socially desirable. The feasibility study recommended the raising of the full supply level of the existing Clanwilliam Dam by 13 m, to augment the water supply to the existing scheduled irrigation area, towns, and industrial use, as well as to provide additional water for new irrigation areas to establish historically disadvantaged farmers, as well as supply other local water users.

The environmental authorisation for the raising of Clanwilliam Dam has been effective from February 2010 and the project was approved by the then Minister of Water and Environmental Affairs as a Government Water Works in August 2010. The implementation of this project is currently in the construction stage, which commenced in October 2018, after a significant delay.

1.2 Study Objective

The objective of the *Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam* is to provide recommendations on the bulk conveyance infrastructure required for the equitable distribution of the existing and additional water from the raised Clanwilliam Dam. The additional water will be used to meet the ecological water requirements of the Olifants River, provide irrigation water to existing irrigators at a higher level of assurance and new irrigators and most importantly support historically disadvantaged farming projects and other broad-based black economic empowerment opportunities.

The feasibility design and costing for the bulk infrastructure of three new irrigation schemes have been done, and the project will be made implementation ready.

1.3 Objective of This Report

This report is a synthesis of the agricultural economic and socio-economic analyses undertaken, providing an integrated description of agricultural production and farm development and socio-economic impact analysis, the analysis of the right bank canal costs and benefits. It incorporates the analysis and main conclusions of the reports in **Table 1-1** below.

Table 1-1: Reports Informing Socio-Economic Impact Analysis Report

Report Index	Report Number	Report Title
19	-	Financial Viability of Irrigation Farming Sub-Report
20	P WMA 09/E10/00/0417/11	Agricultural Production and Farm Development
21	-	Right Bank Canal Cost Analysis Sub-Report
22	-	Socio-Economic Impact Analysis Sub-Report
23	P WMA 09/E10/00/0417/12	Socio-Economic Impact Analysis

To motivate the significant investment required for the bulk conveyance infrastructure, to use the additional water from a raised Clanwilliam Dam, it needs to be determined whether the development and water use could be motivated from an economic, socio-economic and policy perspective. The bulk of the investment would need to be allocated from the Fiscus, and hence the return on investment needs to be justified by the water use.

At a high level, potential benefits attached to the investment could be described as follows. Firstly, the water use would unlock economic activities, which has an array of positive effects on the economic and socio-economic *status quo* in the study area and beyond. Secondly, the Fiscus would receive income in the form of rates and taxes and other indirect forms of income. Lastly, the water use would assist to redress the results of past racial and gender discrimination and uplift the poor and destitute communities in the study area.

Analyses were therefore undertaken to determine the financial viability of irrigation farming and the benefits from an economic and socio-economic perspective. It is important that the water would be allocated to benefit historically disadvantaged individuals (HDIs). For this purpose, the proposed farming models, needs analysis of smallholder farmers, case studies, and relevant conclusions from the *Agricultural Production and Farm Development Report* (DWS, 2020) were

also included in this report. A balance needs to be found between commercial sustainability on the one hand, and the needs of HDIs and destitute communities on the other. Both objectives need to be met to obtain approval from all relevant Government Departments and ultimately to motivate for the funding and financing of the scheme.

1.4 Structure of the Report

Chapter 1: Introduction (this Chapter): Introduces and provides background to the study and objectives.

Chapter 2: Overview of the Scheme: Describes the existing scheme, as well as current and potential future water uses.

Chapter 3: Financial viability of irrigation farming: Presents the main findings of the *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018).

Chapter 4: Socio-Economic Implications: Presents the main findings of the *Socio-Economic Impact Analysis Sub-Report* (DWS, 2019).

Chapter 5: Right Bank Canal Scheme Cost Analysis: Presents the main findings of the *Right Bank Canal Cost Analysis Sub-Report* (DWS, 2021).

Chapter 6: Agricultural Production and Farm Development Analysis: Presents the main findings of the *Agricultural Production and Farm Development Report* (DWS, 2020).

Chapter 7: Recommendations: Provides a summary of the most important recommendations to follow from the various investigations that informed this report.

2 Overview of the Scheme

2.1 Current Clanwilliam Scheme

Figure 2-1 provides an overview of the existing conveyance infrastructure downstream of Clanwilliam Dam.

2.2 Clanwilliam Dam

The Clanwilliam Dam has a live storage capacity of 122 million m^3. The dam currently supplies approximately 11 000 ha of scheduled water downstream of the dam. There are 318 ha scheduled allocations from the dam basin.

Due to proposed betterments to improve the safety of the dam wall, the opportunity to raise the dam was investigated. The Feasibility Study, concluded in 2008, found that a 13 m dam raising would be economically viable and socially desirable, thereby increasing the current storage volume to 344 million m^3.

A substantial increase in yield from the dam of 82 million m^3/a (based on a 1:10 year assurance of supply) can be achieved.

2.3 Clanwilliam Canal

The Clanwilliam Canal, approximately 18 km in length, originates at the Clanwilliam Dam wall, passes through Clanwilliam town, and crosses the Jan Dissels River. The canal, which was built in 1940, supplies water for irrigation. The Canal is owned by the DWS, and the Clanwilliam Water User Association is responsible for the canal's operation and maintenance. In the Clanwilliam Scheme, there are 564 ha of scheduled allocations from the Clanwilliam Canal and 665 ha allocated from the Olifants River.

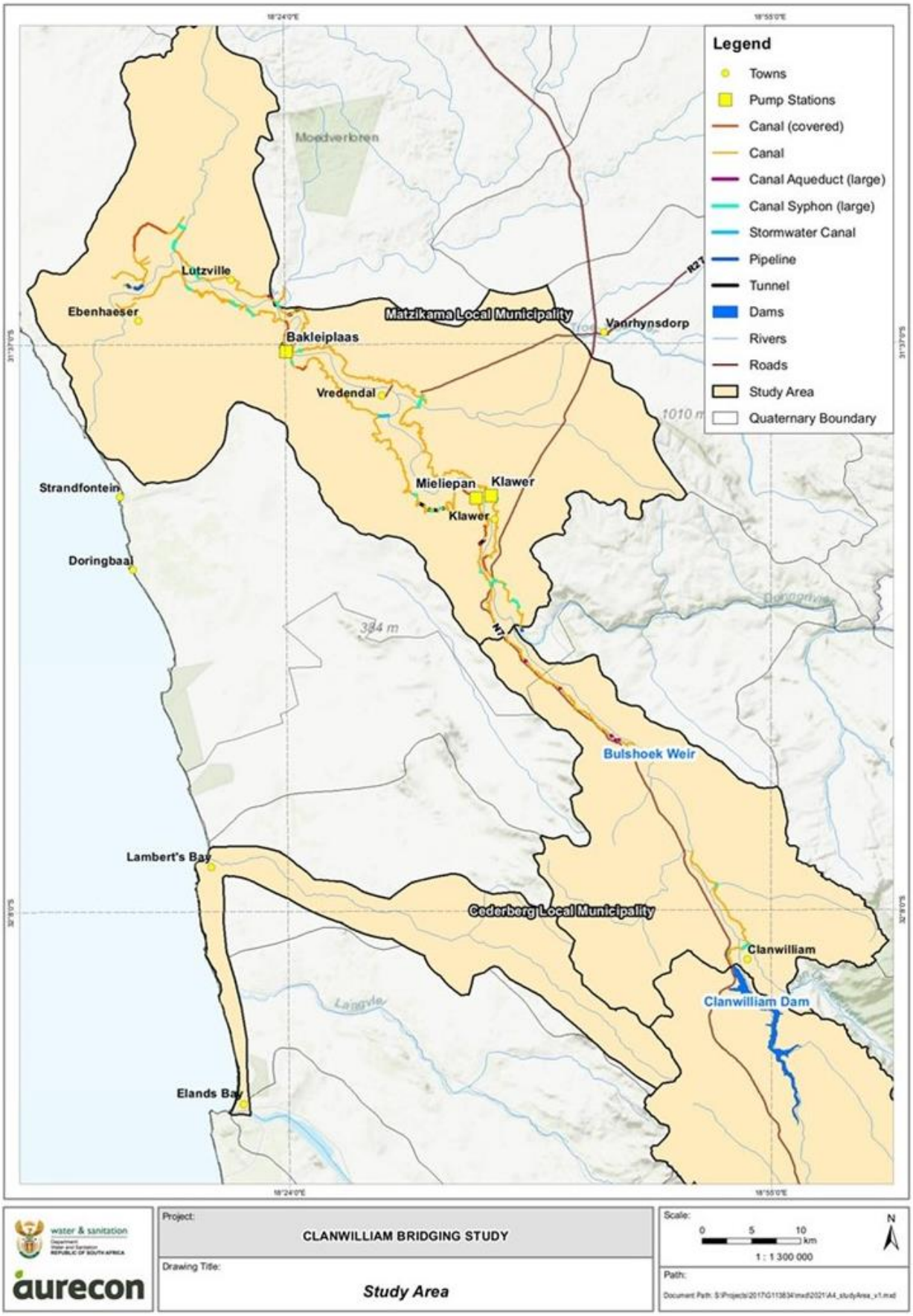

Figure 2-1: Overview of Clanwilliam Dam Existing Infrastructure

2.4 Olifants River (Vanrhynsdorp) Government Water Scheme

The LORWGS consists of the canal system fed from Bulshoek Weir, with water released from the Clanwilliam Dam. The canal system (the Lower Olifants Canal) supplies irrigation, industrial, and domestic water to the Matzikama Municipality for the following towns and communities: Vredendal, Klawer, Lutzville, Koekenaap, Ebenhaeser, Papendorp, Strandfontein, Doring Bay and Vanrhynsdorp. The Tronox Mine at Brand-se-Baai and its smelter near Koekenaap are also supplied with water from the canal system.

The Lower Olifants River Water User Association (LORWUA) is responsible for the general operation and maintenance of the canal, whereas the DWS is responsible for upgrading and refurbishment, including repairs of major breaks. The transfer of the operation and maintenance of LORGWS from the Department of Water Affairs and Forestry (DWAF) (now DWS) to the LORWUA was approved in 2001. LORWUA was established to take over the operation and maintenance of the Bulshoek Weir and the canal distribution system of the scheme. Upon approval of the transfer, certain powers, and duties in terms of the National Water Act (NWA) of 1998 were delegated to LORWUA.

2.5 Bulshoek Weir and Lower Olifants Canal

The stone-masonry gravity Bulshoek Weir was constructed across the Olifants River about 26 km downstream of Clanwilliam town. The Weir has an existing capacity of 4.2 million m^3.

Downstream of the Bulshoek Weir, water is diverted into the Lower Olifants Canal which is the main conveyance system in the LORGWS. The canals and tunnels were mainly constructed during the 1930s.

An overview of the Lower Olifants Canal scheme is shown in Error! Reference source not found.. The canal runs on the left bank (western side) of the Olifants River for approximately 21 km, before it crosses the river with a siphon, and then runs on both sides of the river, with a small section of the canal running upstream along the right bank. The canals continue towards Lutzville, becoming gradually smaller downstream. Water is abstracted at numerous points along the canal (approximately 529 off-takes). Secondary canals distribute water from near Lutzville towards the coast. The lead time for water to travel in the canal from the Bulshoek Weir to the last point at Ebenhaeser is about three days. The total length of the canal system is approximately 237 km.

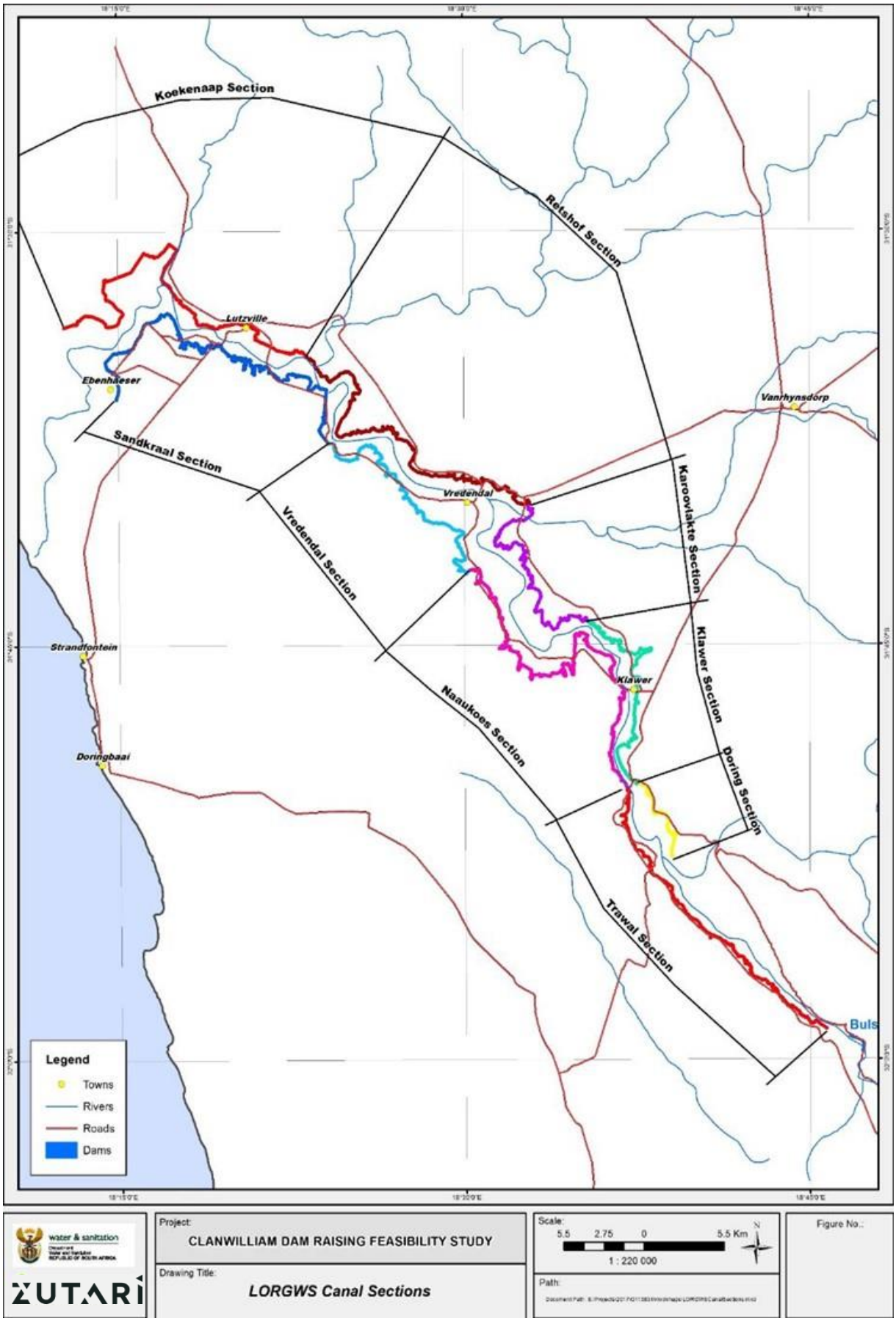

Figure 2-2: Overview of Lower Olifants Existing Infrastructure

Besides supplying irrigation water, the Lower Olifants Canal also supplies water for domestic use (to the Matzikama Municipality) and various industries. The annual allocation to the various water use categories is summarised in **Table 2-1**. In addition, there are approximately 349 unmetered 25 mm house connections from the canal system.

Table 2-1: Scheduled Water Use

Water Use Category	Area (ha)	Scheduled Allocation (m^3/ha)	Annual Allocation (m^3)
Scheduled irrigation	9 013	12 200	109 958 600
Ebenhaeser small farmers	257	12 200	3 135 400
Emerging farmers	240	12 200	2 928 000
Matzikama Municipality	-	-	5 151 000
Industries	-	-	3 200 000
Total	**9 510**		**124 373 000**

Source: (R Nieuwoudt 2018, personal communication, 15 June)

2.5.1 Ebenhaeser Community Property

The LORGWS also provides water to the Ebenhaeser Community Irrigation Project. The existing Ebenhaeser Community Project is located approximately 12 km from Lutzville. Ebenhaeser is scheduled under LORWUA for 257 ha of water use entitlements, which needs to be distributed to 153 plots (1.68 each) plus a commercial farmer with 8.6 ha. The water is delivered to an existing balancing dam at the end of the canal system. The LORWUA operates and maintains the canal system up to the Ebenhaeser balancing dam. A pumped scheme has been constructed to deliver the water under pressure to the smallholders. It is proposed (and there is already a planned layout of plots) that the area on this land will be expanded by at least 170 hectares. Some of this will replace land that cannot be rehabilitated and for which water is already scheduled. There is also other land that could be irrigated in the vicinity.

2.5.2 Ebenhaeser Land Claim

The Ebenhaeser Community who was dispossessed of their land in 1925 in the Lutzville area, has been successful in lodging their land claim almost a century later. In March 2019, thirteen farm parcels were handed over to the Ebenhaeser Community Project Association with a further sixteen transferred in March 2021. This forms part of the total of 44 farms that are part of the longer-term restitution claims lodged. The water allocations to these farms are currently inadequate. For example, there is a 14-ha farm with no water allocation, and a 62 ha farm with a 13 ha allocation.

The community has noted that in 1925 the government promised the people from Ebenhaeser access to 500 morgen (about 400 hectares) of irrigation water, which has to date not been honoured. The expectation from the Ebenhaeser community is therefore that they receive priority.

2.6 Proposed Irrigation Development and Conveyance Infrastructure

The identification and evaluation of new irrigation development options were evaluated as part of the *Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam* (this study). Following screening and refinement, and considering the most significant betterment needs, the following schemes have been recommended for implementation:

Schemes to be located upstream of Bulshoek Weir:

- **Jan Dissels Scheme** located near Clanwilliam Town, to receive a pumped supply from an outlet of the raised Clanwilliam Dam.
- **Transfer of scheduled** allocations, which entails moving identified existing allocations of irrigators in the lower Jan Dissels River to the Olifants River, to relieve over-allocation and improve the ecological condition of the lower section of the Jan Dissels River.
- **Clanwilliam Scheme**, pumping from the lake of the raised Clanwilliam Dam.
- **Zandrug Scheme**, pumping from the Olifants River below the raised Clanwilliam Dam and upstream of Bulshoek Weir.
- **Bulshoek Scheme**, pumping from the Olifants River and the lake of Bulshoek Weir.

Schemes to be located downstream of Bulshoek Weir:

- **Right Bank Canal Scheme**, consisting of the construction of a new main canal section on the right bank of the Olifants River, to replace the existing main canal section on the left bank, and to supply four proposed irrigation development areas near Trawal, namely the Zypherfontein1, Trawal, Zypherfontein 2 and Melkboom irrigation areas. This scheme will overcome the current flow restriction up to the bifurcation of the canal and significantly reduce the risk of supply failure.
- **Klawer Phase 1 Scheme**, using spare capacity in canal section/s to supply the first phase of the Klawer irrigation area close to Vredendal, on the right bank of the Olifants River, after passing through the right bank canal flows intended for the Ebenhaeser Scheme.
- **Klawer Phase 2 Partial Development Scheme**, developing a portion of the remaining Klawer irrigation area, following the completion of the new Right Bank main canal and the upgrading of the Klawer canal section.

- **Coastal 1 Scheme**, using spare capacity in existing canal section/s, located on the left bank of the Olifants River near Vredendal, after passing through the left bank canal flows intended for the Ebenhaeser Scheme, to irrigate a small portion of the Coastal 1 irrigation area.
- **Ebenhaeser Scheme**, using spare capacity in existing canal sections to provide water to restitution farms and to augment the supply to the existing community at Ebenhaeser.

The development of the recommended schemes will:

- Broaden the ownership base of the economy to HDI farmers through new development,
- Mostly focus on high-value and export crops, whilst planning for some subsistence-plus farming,
- Sustainably create jobs and alleviate poverty in a poor region, and
- Improve utilisation of existing infrastructure and resources by combining planned new development with overdue and long-delayed betterment works.

The recommended schemes entail both the development of new land for irrigation as well as the replacement of lower-value crops of existing irrigation with higher-value crops.

These schemes are shown in Error! Reference source not found., except for the Ebenhaeser Scheme, which is located towards the bottom end of the study area, between Lutzville and Ebenhaeser towns. Only partial development of the Klawer and Coastal 1 potential areas (as shown on the map) has been recommended.

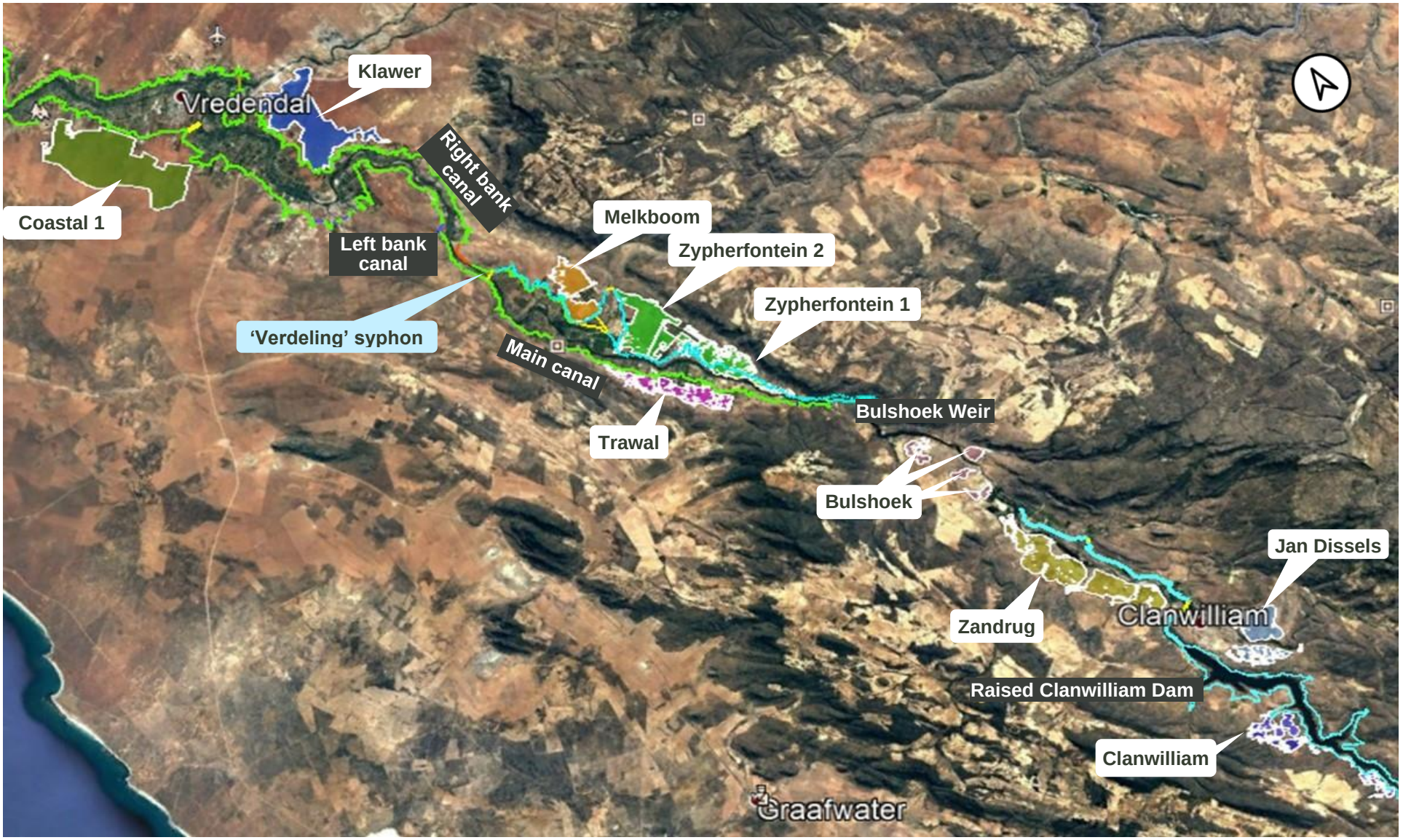

Figure 2-3: Location of the preferred irrigation areas

3 Financial Viability of Irrigation Farming

This chapter describes the evaluation of the financial viability of irrigation farming for various commercial-scale options and smallholders.

3.1 Objective and Approach

The *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018) provides a comprehensive evaluation of the financial viability of irrigation farming in the relevant farming regions. It sets out in detail the financial viability of various pre-identified crops within certain sub-regions of the study area, to form an opinion on the desirability of specific crops to be developed in these regions.

Specific objectives are the following:

- an evaluation of the financial viability of existing irrigation farming in the relevant farming regions;
- an evaluation of the financial viability to expand irrigation farming (i.e., the expansion of existing farms and/or the creation of new farms) in the relevant farming areas; and
- an identification of factors that may be obstructive for new entrants from historically disadvantaged communities.

This Chapter provides an overview of the financial viability investigation and its main findings, as further elaborated upon in the *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018).

3.2 Selection of Crops

The following criteria were used for selecting crops to evaluate within this study area:

- Crops which are well suited to the climate and soils enabling high yields and good quality to be produced.
- Crops which are tried and tested in the area and already grown on a large scale commercially. Crops grown on a smaller scale with limited economic contribution to the region were therefore not selected.

Based on the above criteria the following crops were selected for this evaluation:

1. Table grapes;
2. Citrus;
3. Raisins;
4. Wine grapes;
5. Tomatoes with brassica seed in rotation; and
6. Potatoes with wheat, in rotation.

3.2.1 Table Grapes

The bulk of South Africa's table grapes are exported. The Olifants River table grape producing area falls into a relatively early production window in the South African season, directly after the early areas, such as Limpopo and the Orange River. A shortage of water has resulted in limited expansion in the Olifants River area to date. As a result, there is still a relative shortage of table grapes during this production window, providing a good opportunity for future expansion in the Olifants River area.

3.2.2 Citrus

Citrus is the largest export fruit commodity in South Africa and the industry has performed well in recent years resulting in consistent growth in new plantings. Citrus volumes were down in the 2017 season, mainly due to a drop in orange volumes resulting from the drought in the Limpopo region and due to fruit drop in the Eastern Cape. Soft citrus and lemon volumes are set to grow considerably in the coming years because of new plantings and South Africa will need to grow its export markets for these crops.

3.2.3 Wine Grapes

Both the local and export markets play an important role in the South African wine industry. There is currently a shortage of bulk wine on a global level. It is anticipated that the South African price for bulk wine will therefore increase by up to 20%, providing some relief to growers.

3.2.4 Raisins

Global raisin production for 2017/2018 is also expected to decrease by 2% as modest gains in China are offset by lower output in Turkey, USA, and Iran. Because of reduced supply, total stocks are expected to plunge 22% to 84,000 tons, an 8-year low. This also poses an opportunity for raisin exports from South Africa and indications from the South African Dried Fruit Association (SAD) are that the supply is expected to remain short in the world market for the foreseeable future.

3.2.5 Potatoes

The South African potato market is comprised of The National Fresh Produce Markets, processing, informal trade, retail, and export, with the bulk of the volume sold in the local market. Slightly more than two thirds of the national crop are marketed in the formal market sector. South African production has increased by 35% in a decade from 2005 to 2015, to 248 million 10 kg bags. At the same time the number of producers has decreased, due to increased yields and an increase in the number of hectares per farmer.

3.2.6 Crop Types and Crop Water Use Requirements

Refer to **Table 3-1** for crop types recommended for each region.

Table 3-1: Identified Irrigation Zones and Suitable Crops (DWS, 2018)

Zone	Location	Suitable Crops
1	Citrusdal	• Citrus (oranges & soft citrus)
2	From Clanwilliam Dam Wall to Bulshoek Weir (including Jan Dissels River)	• Citrus (oranges & soft citrus) • Table Grapes • Potatoes / wheat in rotation
3	Jakkalsvlei / Graafwater	• Potatoes • Grazing
4	From Bulshoek Weir to Trawal	• Table grapes • Raisins • Wine grapes • Tomatoes / brassica seed in rotation
5	From Trawal to the Coast	• Table grapes • Raisins • Wine grapes • Tomatoes / brassica seed in rotation

A summary of proposed crop water use requirements for each geographical area is shown below in **Table 3-2**. The table includes the irrigation efficiency factor for each crop type. It is recommended to make use of the most recent Validation & Verification (V&V) information for the planning of bulk infrastructure options (DWS, 2018).

Table 3-2: Summary of crop water use requirements per geographical area

Zone	Crop	Water use (m^3/ha/a)			Proposed volume (m^3/ha/a)
		Source	Efficiency factor	Volume	
1 – Citrusdal	Citrus	2004 Feasibility	90%	13 280	10 000
		V&V	90%	10 000	
		DOA	90%	14 310	
		DWS	90%	13 002	
2 – Clanwilliam	Citrus	2004 Feasibility	90%	14 100	11 000
		Jan Dissels study	90%	8000 (micro)	
		V&V	90%	11 000	
		DWS	90%	14 901	
	Table grapes	Jan Dissels study	90%	9000 (micro)	11 340
		V&V	90%	11 340	
		DWS	90%	12 417	
	Potatoes	2004 Feasibility	85%	5490	10 080
		DWS	80%	7440 / 10 811	
		V&V	80%	10 080	
3 – Jakkalsvlei / Graafwater	Potatoes	V&V	80%	10 080	10 080 Note that the value for Clanwilliam will also be used apply to the Jakkalsvlei / Graafwater area)
4 – Bulshoek to Trawal (quat E10K)	Table grapes	V&V	90%	11 340	11 340
	Wine grapes / raisins	V&V	90%	9 500	9500
	Tomatoes	No data	-	-	It is recommended to use the V&V figure of 9281, which is the generic quota for vegetables

Zone	Crop	Water use (m^3/ha/a)			Proposed volume (m^3/ha/a)
		Source	Efficiency factor	Volume	
	Vegetables (general)	V&V	80%	9281	9281
	Brassica	No data	-	-	Recommended to use Zone 5 figures of either 5030 or 2080, depending on season (as available from the DOA data)
5 – Klawer to Coast (quats E33G and E33H)	Table grapes	V&V	90%	12 390 (Vredendal)	12 390
		DOA	90%	4 560 (Vredendal)	
			90%	5 320 (Lutzville)	
		DWS	90%	12 128 (Klawer)	
			90%	11 959 (Lutzville)	
	Wine grapes / raisins	2004 feasibility	95%	9 650 (Klawer)	9500
			95%	9 080 (Lutzville)	
		V&V	90%	9 500	
		DOA	90%	7 110 (Lutzville)	
			90%	5 960 (Vredendal)	
		DWS	90%	10 669 (Klawer)	
			90%	10 551 (Lutzville)	
	Tomatoes (processing)	2004 feasibility	95%	6 930 (Klawer, Dec)	Recommended V&V value of 9 281 for vegetables
			95%	6 340 (Lutzville, Dec)	
	Tomatoes (table)	2004 feasibility	95%	8 410 (Klawer, Dec)	
			95%	9 340 (Klawer, Sep)	
			95%	7 740 (Lutzville, Dec)	
			95%	8 760 (Lutzville, Sep)	
	Tomatoes (unspecified)	DOA	80%	2 830 (Vredendal, Mar)	

Zone	Crop	Water use (m^3/ha/a)			Proposed volume (m^3/ha/a)
		Source	Efficiency factor	Volume	
			80%	4 710 (Vredendal, Jun)	
			80%	8 800 (Vredendal, Sep)	
			80%	8 180 (Vredendal, Nov)	
			80%	3 700 (Lutzville, Mar)	
			80%	6110 (Lutzville, Jun)	
			80%	10 390 (Lutzville, Sep)	
			80%	9 980 (Lutzville, Nov)	
		DWS	80%	11 276 (Lutzville, Sep)	
	Vegetables	V&V	80%	9 281	9 281
	Brassica	DOA	80%	4 000 (Vredendal, Feb)	Recommended to use maximum volumes – either 5 030 or 2 080, depending on season
			80%	2 080 (Vredendal, Apr)	
			80%	5 030 (Lutzville, Feb)	
			80%	2 660 (Lutzville, Apr)	

3.3 Minimum Viable Farm Sizes

The minimum viable farm sizes resulting from the financial evaluations done are presented in **Table 3-3**, according to the identified commodities. The minimum viable farm size for an existing farm was calculated, as well as the minimum viable farm size for a new black-owned farm, where the land was obtained at no cost.

Table 3-3: Minimum Viable Farm Sizes

Crop	Existing Commercial (ha)	New Black Owned (JV model) (ha)
Citrus	22	90 (@IRR 8%)
Table Grapes	16	46 (@IRR > 9.25%)
Wine Grapes	Not currently viable	Not currently viable
Raisins	68/12	26 (@IRR > 9.25%)
Tomatoes/Brassica seed - commercial	27	41 (@IRR > 9.25%)
Tomatoes/Brassica seed - small scale production	6	6 (@IRR > 9.25%)

The following important notes relating to the values in Table E3 should be considered:

- The minimum viable farm size was determined by reducing the area (hectares) in the financial model to such a point that the real Internal Rate of Return (IRR) remains above 9.25%,
- The IRR for New Black-Owned citrus farms is 8% instead of >9.25% to keep the farm size reasonable. The capital requirement to establish a new farming venture and the overhead costs of running a commercial farm are high in relation to the farm's productive value, particularly given the time it takes for new plantings of perennial crops to come into full production,
- For raisins, the minimum viable farm size of 68 ha is based on the current average yield of 22 ton/ha, while the 12-ha farm size was calculated at a yield of 50 ton/ha based on top varieties and best practice.

In terms of the Black Producer Commercialisation Programme of DAFF (now DALRRD), a "Commercial Producer" is defined as a venture undertaken by an individual or business entity for the purpose of production and sale of agricultural products to make a profit. The annual turnover of commercial producers must exceed a minimum economic threshold (i.e., >R500 000) and be sufficient to support the producer and his family.

3.4 Findings – Financial Viability of Irrigation Farming

The multi-period financial analysis was executed at constant 2016/17 price levels (on farm bulk water infrastructure costed at 2018 values). The discounting of the expected future financial results was done at a real interest rate of 4.25% per year (i.e., the difference between a nominal interest rate of 10.25% per year and an annual inflation rate of 6%).

3.4.1 Evaluation Criteria

The financial viability analysis focuses on the expected profitability and affordability of irrigation farming in the study area. It also aims to illustrate the relative "efficiency" of the consumption of irrigation water in the different regions of the study area.

a. Profitability

The expected profitability of the typical farming operations in the different regions of the study area is measured by the following mechanisms:

- Internal Rate of Return on the capital employed (IRR);
- The net present value (NPV) per hectare of the expected flow of funds over the calculation period;
- The Gross Profit Margin; and
- Earnings Before Tax (EBT).

Note however that only the IRR and NPV/ha are indicated in the summary tables. Gross Profit Margin and EBT are indicated in the Annexures.

b. Affordability

Farming operations in the study area are relatively capital intensive and risky due to, inter alia, uncertain farming output and product prices. Another reality that faces the farmer is the trend that the market value of land often exceeds the productive value thereof. This implies that a farmer should be able to supply an appropriate portion of the capital needs from his own financial sources. When stated in another way, this means that, in general, farm output-value will not be able to remunerate all the farming inputs when the total capital need for the farm is financed via loaned capital.

The impact of different own-to-loaned capital ratios on the break-even year of the expected cash flow from farming is illustrated to indicate affordability.

c. "Efficiency" of irrigation water consumption

Two criteria are employed to illustrate the relative "efficiency" of the consumption of irrigation water in the different regions of the study area. They are the following:

- The annual net financial benefit that is realised from irrigation farming per m^3 of water used per year; and
- The ratio of job creation per 1 000 m^3 of irrigation water consumed serves as a criterion of the relative "efficiency" of the different regions of the study area.

Please note that these jobs are Full-Time Equivalents (FTE), which means that both full time and part time job opportunities in the value chain were considered. Part time job opportunities were converted to their equivalents in full-time terms, i.e., a 6-month job equals 50% of an FTE.

3.4.2 Financial Viability of Existing Irrigation Farming

The financial viability of existing irrigation farming in the different regions of the study area is presented fully in the *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018), with a summary thereof in **Table 3-4**.

Table 3-4: Financial Viability of Existing Farms in the Study Area

Area	Crop	Cultivated ha per annum	Water needed (m^3/ha)	Real IRR	NPV/ha	Annuity / m^3 water	Breakeven year			Jobs (FTE) / 1 000 m^3 water
							Equity at 80%	Equity at 60%	Equity at 40%	
Zone 1 - Citrusdal	Citrus	90	11 380	28.1%	671 459	3.9	6	6	6	0.10
Zone 2 - Clanwilliam Dam Wall to Bulshoek Weir (including Jan Dissels River)	Citrus	90	12 250	31.4%	690 993	3.7	6	6	6	0.09
	Table grapes	50	9 000	30.7%	780 266	5.7	6	6	6	0.33
	Potatoes & wheat[1]	70	4 997	1.1%	(198 530)	(2.6)	>14	>14	>14	0.02
Zone 3 - Bulshoek Weir to Ebenhaeser (Trawal, Klawer, Vredendal, Melkboomsdrift, Lutzville, Koekenaap, Ebenhaeser)	Table grapes (Trawal)[2]	50	13 580	29.9%	758 754	3.7	6	6	7	0.22
	Table grapes (Vredendal)[2]	50	13 037	33.9%	593 141	3.0	5	5	6	0.23
	Raisins[3]	64	9 106	8.5%	23 631	0.2	14	>14	>14	0.02
	Wine grapes[4]	64	9 106	0.2%	(180 749)	(1.3)	>14	>14	>14	0.02
	Tomatoes & Brassica seed[5]	55	6 930	-0.7%	(114 235)	(1.1)	>14	>14	>14	0.13

Notes:
- The model was developed using constant 2016/17 values, with a real discount rate of 4.25%, being the difference between the nominal interest rate at 10.25% and inflation at 6%
- Annuity per m^3 water is calculated at the real discount rate over 25 years
- Jobs are calculated as Full Time Equivalent (FTE) jobs
- The estimated market value of existing farms is taken into consideration in calculating the returns with an exit value based on the aforementioned, plus capex less depreciation
- [1]The Potato / wheat budget is based on 30ha's of potatoes and 40ha's of wheat per annum (on 90ha's land) allowing a 1 in 3 year rotation for potatoes and 1 in 2 year rotation on wheat
- [2]The Table grape harvest is 7-10 days later at Vredendal than Trawal and DIP price assumption therefore R7.5 per carton lower but farm market value is lower at Vredendal countering the impact on IRR
- [3]The average study group raisin yield of 22tons/ha wet was used. However new plantings of the most suitable varieties can consistently yield 50 tons/ha raising the IRR to 74%
- [4]A worldwide shortage of bulk wine has recently developed resulting in indications that prices will increase by 20% which would raise the IRR of wine grapes to 5.1%
- [5]The average indicated tomato yield of 90 tons per ha was used. However top growers achieve up to 140tons/ha and some consistently exceed 120 tons/ha which raises the IRR to 32%
- [5]The tomato and brassica model is based on 50ha's of tomatoes planted in summer and 5ha's of brassica seed planted in winter

IRR > 4.25%
IRR < 4.25% with potential based on yield or price increases
IRR < 4.25%

Based on the information provided in the summary table (**Error! Reference source not found.**), the following findings could be made on the key indicators.

a. Profitability

Existing irrigation farming of citrus, table grapes and raisins is financially viable with a real IRR of greater than 4.25% (this is true in all the relevant zones). Citrus farming in Zone 2 is potentially more profitable than citrus farming in Zone 1, as the Clanwilliam area has a lower land value and does not require private off-line dams. Table grapes is also potentially more profitable in Vredendal than in Trawal, due to the lower land value in Vredendal.

Potatoes with wheat in rotation, wine grapes and tomatoes with brassica seed in rotation are currently not deemed to be profitable, based on current yields, production costs and sales prices, as they have a real IRR of less than 4.25%.

However, wine grapes and tomatoes have the potential to become profitable based on yield or price increases. In this regard the following changes could take place:

- Currently there is a worldwide shortage of bulk wine. This results in indications that prices will increase by 20% which would raise the IRR of wine grapes to 5.1%; and
- The average indicated tomato yield of 90 tons/ha was used. Top growers however consistently exceed 120 ton/ha, which would raise the IRR to 32%.

In line with the above, raisins could also benefit from a much higher IRR under the right circumstances. The average Vinpro study group (data evaluated for a group of farmers by Vinpro) raisin yield of 22 ton/ha was used. New plantings of the most suitable varieties can however yield 50 ton/ha which would raise the IRR to 74%.

Potatoes and wheat are deemed to be the least profitable within this model, and no additional factors were considered in this study to influence their profitability.

With regards to NPV/ha, table grapes in Zones 2 and 3 (only Trawal) have the highest NPV/ha, followed by citrus in Zones 1 and 2 and table grapes in Zone 3 (Vredendal). Raisins have a very low NPV/ha, and potatoes & wheat, wine grapes and tomatoes & brassicas have a negative NPV/ha.

b. Affordability

The impact of different own-to-loaned capital ratios on the break-even year of the expected cash flow was illustrated to indicate affordability.

It could be concluded that citrus and table grapes are more affordable than the other crops, as their breakeven takes place consistently at or about year 6 even at different own-to-loaned ratios (40%, 60% and 80% equity respectively). Note that there is sufficient cash flow to make provision for a similar break-even at the ratios mentioned.

The break-even for potatoes / wheat, wine grapes and tomatoes / brassica seed all happen after year 14. It is indicated as such, given that the financial model only makes provision for a 15-year cash flow.

c. "Efficiency" of irrigation water consumption

The annuity per m^3 water is the highest for table grapes in Zone 2, followed by citrus in Zone 1, citrus in Zone 2 and table grapes in Zone 3 (with a distinction between Trawal and Vredendal). Raisins have a very low annuity, followed by potatoes & wheat, wine grapes and tomatoes / brassica seed which each has a negative annuity expressed in m^3 per ha.

The ratio of job creation per 1 000 m^3 of irrigation water is the highest for table grapes, followed by tomatoes with brassica seed in rotation and citrus being the most labour-intensive crops. The job creation per 1000 m^3 for raisins, wine grapes, potatoes / wheat are all similar and much lower than the other crops. Please note that the job creation figures are based on the labour requirement at full production.

3.4.3 Expansion of Existing Irrigation Farming

The financial viability of the expansion of existing irrigation farming on typical farms in the different regions of the study area is presented fully in the *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018), with a summary thereof in **Table 3-5**.

Please note that only the *additional* income and expenditure related to the expansion was included in the financial evaluations. The increase in land value from a dry land value to a higher value based on the availability of irrigation water was also considered.

The findings of expanding existing irrigation in Zone 1 (Citrusdal) was not presented, as the need for additional private storage dams would be a barrier to entry for most entities.

Table 3-5: Financial Viability of Expansion of Existing Farms in the Study Area

Area	Crop	Cultivated ha per annum	Water needed (m^3/ha)	Real IRR	NPV/ha	Annuity / m^3 water	Breakeven year			Jobs (FTE) / 1 000 m^3 water
							Equity at 80%	Equity at 60%	Equity at 40%	
Zone 2 - Clanwilliam Dam Wall to Bulshoek Weir (Including Jan Dissels River)	Citrus Clanwilliam	20	12 250	13.1%	631 385	3.39	9	10	10	0.09
	Table grapes	20	9 000	17.3%	744 835	5.44	8	8	9	0.33
	Potatoes/wheat[1]	20	4 997	13.8%	70 179	0.92	>14	>14	>14	0.02
Zone 3 - Bulshoek Weir to Ebenhaeser (Trawal, Klawer, Vredendal, Melkboomsdrift, Lutzville, Koekenaap, Ebenhaeser)	Table grapes (Trawal)	20	13 580	17.2%	730 791	3.54	8	8	9	0.22
	Table grapes (Vredendal)	20	13 037	14.6%	512 476	2.58	9	9	10	0.23
	Raisins[2]	20	9 106	5.1%	(87 088)	(0.63)	>14	>14	>14	0.02
	Wine grapes[3]	20	9 106	1.6%	(212 536)	(1.53)	>14	>14	>14	0.02
	Tomatoes/brassica seed[4]	20	6 930	9.0%	27 930	0.26	>14	>14	>14	0.15

Notes:
- The model was developed using constant 2016/17 values, with a real discount rate of 4.25%, being the difference between the nominal interest rate at 10.25% and inflation at 6%
- Annuity per m^3 water is calculated at a real discount rate over 25 years
- Jobs are calculated as Full Time Equivalent (FTE) jobs at full production
- In calculating the return on the expansion, only the additional income and expenditure (capital, fixed and variable) related to the expansion has been taken into consideration. The increase in land value based on the change from dry land to irrigable based on the issue of additional water rights has also been factored in
- Expansion of Citrus farms in Citrusdal has not been included as this would require the construction of an additional farm dam, which will significantly impact viability of the expansion
- [1]The expansion of the potato/wheat farm is based on the addition of one 20ha centre pivot with a 1 year in 3 rotation on potatoes and 1 in 4 on wheat
- [2]The average study group raisin yield of 22tons/ha wet was used. However new plantings of the most suitable varieties can consistently yield 50 tons/ha raising the IRR to 19.1%
- [3]A worldwide shortage of bulk wine has recently developed resulting in indications that prices will increase by 20% which would raise the IRR of wine grapes to 4.1%
- [4]The tomato and brassica model is based on 20ha's of tomatoes planted in summer and 2ha's of brassica seed planted in winter

IRR > 4.25%
IRR < 4.25% with potential based on yield or price increases
IRR < 4.25%

Based on the information provided in the summary table (**Table 3-5**), the following findings could be made on the key indicators.

a. Profitability

The expansion of existing irrigation farming is financially viable for all crops except wine grapes, as these crops all indicate an IRR of greater than 4.25%. A worldwide shortage of bulk wine has recently developed, which indicates that prices could increase by up to 20% and would raise the IRR to 4.1% (this is however still under the target of 4,25%). Please also note that the average study group raisin yield of 22 ton/ha was used. New plantings of the most suitable varieties could however yield 50 ton/ha consistently, which would raise the IRR to 19.1%.

With regards to NPV/ha, citrus and table grapes show consistent high values, followed by potatoes & wheat and tomatoes & brassica seed showing low but positive values. Raisins show a negative NPV/ha, and wine grapes show a significantly negative NPV/ha.

b. Affordability

It is concluded that citrus and table grapes are more affordable than the other crops, as their breakeven takes place consistently at year 8, 9 or 10. The values also change slightly with different own-to-loaned ratios (40%, 60% and 80% equity respectively). The change in breakeven does differ as the equity portion decreases. This shows that cash flow is a factor to be considered for the expansion of existing irrigation.

The break-even for potatoes & wheat, raisins, wine grapes and tomatoes & brassica seed all happen after year 14. It is indicated as such, given that the financial model only makes provision for a 15-year cash flow. These crops are therefore the least affordable in this model.

c. "Efficiency" of irrigation water consumption

The annuity per m^3 water is the highest for table grapes in Zone 2 and 3 (Trawal), followed by citrus in Zone 2 and table grapes in Zone 3 (Vredendal). Potatoes with wheat and tomatoes with brassica seed have a very low annuity. Raisins and wine grapes have a negative annuity.

The ratio of job creation per 1000 m^3 of irrigation water is the highest for table grapes, followed by tomatoes with brassica seed and citrus, being the most labour-intensive crops. The job creation per 1000 m^3 for raisins, wine grapes, potatoes & wheat and are all similar and much lower than the other crops. Please note that these figures are identical to the figures for existing irrigation farms, as the water use requirements and employment creation capabilities for the crops remain constant.

3.4.4 New Irrigation Farms

The expected financial viability of the development of typical irrigation farms on virgin land in the relevant regions of the study area are presented fully in the *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018), with a summary thereof in **Table 3-6**.

Table 3-6: Financial Viability of New Farms in the Study Area

Area	Crop	Cultivated ha per annum	Water needed (m^3/ha)	Real IRR	NPV/ha	Annuity / m^3 water	Breakeven year			Jobs (FTE) / 1 000 m^3 water
							Equity at 80%	Equity at 60%	Equity at 40%	
Zone 1 - Citrusdal	Citrus[1]	90	11 380	2.4%	(109 585)	(0.63)	14	14	>14	0.10
Zone 2 - Clanwilliam Dam Wall to Bulshoek Weir (Including Jan Dissels River)	Citrus[1]	90	12 250	4.6%	20 568	0.11	13	14	14	0.09
	Table grapes	50	9 000	8.7%	169 295	1.24	13	14	>14	0.33
	Potatoes/wheat[2]	70	4 997	1.0%	(222 043)	(2.92)	>14	>14	>14	0.02
Zone 3 - Bulshoek Weir to Ebenhaeser (Trawal, Klawer, Vredendal, Melkboomsdrift, Lutzville, Koekenaap, Ebenhaeser))	Table grapes (Trawal)[3]	50	13 580	8.5%	155 250	0.75	13	14	>14	0.22
	Table grapes (Vredendal)[3]	50	13 037	6.3%	(49 565)	(0.25)	13	14	>14	0.23
	Raisins[4]	64	9 106	1.2%	(298 646)	(2.16)	>14	>14	>14	0.02
	Wine grapes[5]	64	9 106	-2.3%	(446 670)	(3.22)	>14	>14	>14	0.02
	Tomatoes & brassica seed[6]	55	6 930	-0.3%	(238 717)	(2.26)	>14	>14	>14	0.13

Notes:
- The model was developed using constant 2016/17 values, with a real discount rate of 4.25%, being the difference between the nominal interest rate at 10.25% and inflation at 6%
- Annuity per m^3 water is calculated at a real discount rate over 25 years
- Jobs are calculated as Full Time Equivalent (FTE) jobs
- In calculating the IRR, the current estimated land value for undeveloped irrigable land together with all necessary capital expenditure to develop and equip the farms have been taken into account. An exit value has also been calculated in year 15 based on the total capital expenditure to that point, less depreciation
- It is assumed that new citrus plantings take place over three years and new table and wine grape plantings over 2 years
- [1]A new Citrusdal farm will require construction of a dam whereas it is assumed a farm in Clanwilliam will irrigate directly from the river or canal
- [2]The Potato / wheat budget is based on 30ha's of potatoes and 40ha's of wheat per annum (on 90ha's land), allowing a 1 in 3 year rotation for potatoes and 1 in 2 year rotation on wheat
- [3]The Table grape harvest is 7-10 days later at Vredendal than Trawal and DIP price assumption therefore R7.5 per carton lower but farm market value is lower at Vredendal countering the impact on IRR
- [4]The average study group raisin yield of 22tons/ha wet was used. However new plantings of the most suitable varieties can consistently yield 50 tons/ha raising the IRR to 14%
- [5]A worldwide shortage of bulk wine has recently developed resulting in indications that prices will increase by 20%, which would raise the IRR of wine grapes to -0.01%
- [6]The average indicated tomato yield of 90 tons per ha was used. However better growers achieve up to 140tons/ha and some consistently exceed 120 tons/ha which raises the IRR to 14%
- [6]The tomato and brassica model is based on 50ha's of tomatoes planted in summer and 5ha's of brassica seed planted in winter

IRR > 4.25%
IRR < 4.25% with potential based on yield or price increases
IRR < 4.25%

Based on the information provided in the summary table (**Table 3-6**), the following findings could be made on the key indicators. Please note that the permanent crops (citrus, table grapes, wine grapes and raisins) only come into full production after several years and have significant establishment costs, which has a significant impact on profitability when compared to established farms that are already in production.

a. Profitability

In general, the development of new irrigation farms seems to be problematic from a financial viability viewpoint. Given the reality of relatively profitable existing farming operations in the various regions of the study area, the major contributing factor to lower profit margins is the expected relatively high capital cost of the development of new farms and the time taken to come into full production.

Only the development of new table grape farms and citrus farms in Clanwilliam is financially viable with an IRR of more than 4.25% and a positive NPV/ha. Establishing new Citrus farms in Citrusdal is not profitable with the cost of building additional off-line water storage capacity being a significant factor. Further to this, citrus takes longer to come into full production than table grapes, which also has an impact on the viability of establishing new farms.

None of the other crops that form part of this study (raisins, wine grapes, potatoes & wheat, and tomatoes & brassica seed) are deemed profitable from a greenfield farming perspective, as the IRR and NPV/ha values are too low.

Raisins and tomatoes could however be profitable under the right circumstances. The profitability of raisins is based on a yield of 22 ton/ha. New plantings however consistently deliver yields of 50 ton/ha, which could increase the IRR of raisins to 13.9%. The average tomato yield of 90 ton/ha was also used, but certain growers achieve up to 140 ton/ha and consistently exceed 120 ton/ha, which raises the IRR to 14.4%.

It should be noted that all crops except table grapes and citrus in Clanwilliam have a negative NPV/ha over the 15-year horizon.

b. Affordability

For table grapes in Zones 2 and 3, as well as citrus in Zone 2, breakeven takes place in year 13 at 80% equity, and in year 14 at both 60% and 40% equities. Breakeven for citrus in Zone 1 takes place in year 14.

In respect of all the other crops (potatoes & wheat, raisins, wine grapes and tomatoes & brassica seed), breakeven only takes place after year 14, even at different levels of equity (80%, 60% and 40% respectively).

c. "Efficiency" of irrigation water consumption

The annuity expressed in m^3 per ha is the highest for table grapes, followed by citrus and raisins. Potatoes with wheat and wine grapes have a negative annuity.

The ratio of job creation per 1000 m^3 of irrigation water is the highest for table grapes, followed by tomatoes with brassica seed and citrus, being the most labour-intensive crops. The job creation per 1000 m^3 for raisins, wine grapes, potatoes & wheat and are all similar and much lower than the other crops. Please note that these figures are identical to the figures for existing irrigation farms, as the water use requirements and employment creation capabilities for the crops remain constant.

3.4.5 Financial Viability of Black-Owned Farms in the Study Area

Given that equitable water access and water allocation reform are key policy considerations in this study, the financial viability of black-owned farms should also be investigated.

The provision of land at no cost is a potential option to lower barriers to entry for historically disadvantaged subsistence, smallholder, and commercial producers. This could, for instance, take place through government grants for purchasing land, farming on government-owned land or other commonage schemes.

It should also be determined what the minimum viable commercial unit would be as HDIs do not always have access to sufficient land at sufficient economies of scale for irrigation. Further to this, the financial viability of a typical subsistence farm should also be investigated, as there are several subsistence farmers in the study area (especially in the case of Ebenhaeser).

The following options are discussed in this section:

- development of new black-owned commercial farms where land is provided at no cost (e.g., new irrigation areas such as Jan Dissels River or Zypherfontein),
- the financial feasibility of a small-scale commercial farm in Ebenhaeser (3ha), and
- an investigation into the minimum viable farm size for existing farms and new black-owned commercial farms.

These options could inform the policy for allocation of water to HDIs.

3.4.6 New Black-Owned Commercial Farms in the Study Area

In this section, the financial viability of new black-owned farms in the study area is investigated, based on the assumption that black-owned farms will receive the land at no cost. The findings are presented fully in the *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018), with a summary thereof in **Table 3-7**.

Table 3-7: Financial Viability of New Black-Owned Farms in the Study Area

Area	Crop	Cultivated ha per annum	Water needed (m^3/ha)	Reall IRR	NPV/ha	Annuity / m^3 water	Breakeven year			Jobs (FTE) / 1 000 m^3 water
							Equity at 80%	Equity at 60%	Equity at 40%	
Zone 1 - Citrusdal	Citrus	90	11 380	6.1%	90 415	0.52	12	12	13	0.10
Zone 2 - Clanwilliam Dam Wall to Bulshoek Weir (Including Jan Dissels River)	Citrus	90	12 250	8.0%	170 568	0.92	11	11	12	0.09
	Table grapes	50	9 000	10.2%	281 312	2.1	12	12	13	0.33
	Potatoes & wheat[1]	70	4 997	1.7%	(108 959)	(1.4)	>14	>14	>14	0.02
Zone 3 - Bulshoek Wier to Ebenhaeser (Trawal, Klawer, Vredendal, Melkboomsdrift, Lutzville, Koekenaap, Ebenhaeser)	Table grapes	50	13 580	9.9%	259 800	1.26	12	12	13	0.22
	Raisins[2]	64	9 106	1.5%	(209 032)	(1.5)	>14	>14	>14	0.02
	Wine grapes[3]	64	9 106	-3.0%	(357 056)	(2.6)	>14	>14	>14	0.02
	Tomatoes & brassica seed[4]	55	6 930	-0.5%	(149 103)	(1.4)	>14	>14	>14	0.13

Notes:
- The model was developed using constant 2016/17 values, with a real discount rate of 4.25%, being the difference between the nominal interest rate at 10.25% and inflation at 6%
- Annuity per m^3 water is calculated at a real discount rate over 25 years
- Jobs are calculated as Full Time Equivalent (FTE) jobs at full production
- It is assumed that new Citrus palntings take place over three years and table and wine grapes over two years
- It is assumed that government land is granted to the growers
- [1]The Potato / wheat budget is based on 30ha's of potatoes and 40ha's of wheat per annum (on 90ha's land) allowing a 1 in 3 year rotation for potatoes and 1 in 2 year rotation on wheat
- [2]The average study group raisin yield of 22tons/ha wet was used. However new plantings of the most suitable varieties can consistently yield 50 tons/ha raising the IRR to 17%
- [3]A worldwide shortage of bulk wine has recently developed resulting in indications that prices will increase by 20% which would raise the IRR of wine grapes to -0.2%
- [4]The average indicated tomato yield of 90 tons per ha was used. However top growers achieve up to 140tons/ha and some consistently exceed 120 tons/ha which raises the IRR to 24%
- [4]The tomato and brassica model is based on 50ha's of tomatoes planted in summer and 5ha's of brassica seed planted in winter

IRR > 4.25%
IRR < 4.25% with potential based on yield or price increases
IRR < 4.25%

Based on the information provided in **Table 3-7**, the following findings could be made on the key indicators.

a. Profitability

Table grapes and citrus are both profitable with an IRR of more than 4.25%. Citrus in Zone 1 is less profitable than citrus in Zone 2, as citrus in Zone 1 would require the building of additional storage dams. Table grapes in Zone 2 has the highest NPV/ha, followed by table grapes in Zone 3. The NPV/ha for citrus is also favourable, with citrus in Zone 2 higher than that of citrus in Zone 1.

Raisins and tomatoes & brassica seed are not profitable but could become profitable under the right circumstances. For raisins, the average study group yield is 22 ton/ha, but new plantings of the most suitable varieties could yield 50 ton/ha, raising the IRR to 17%. The average yield for tomatoes of 90 ton/ha was used. Top growers however achieve up to 150 ton/ha and some consistently exceed 120 ton/ha, which raises the IRR to 24%.

Wine grapes and potatoes/ wheat are not deemed profitable in terms of either IRR or NPV/ha, as these values are negative. The IRR of wine grapes could increase to 0.6% if the price is increased due to expected market conditions, but this is still lower than the target IRR of 4.25%.

b. Affordability

The breakeven for both citrus and table grapes take place at or about year 11 or 12 for equity at 80%, 60% or 40%. Potatoes / wheat, raisins, wine grapes and tomatoes / brassica seed break even after year 14.

c. "Efficiency" of irrigation water consumption

The annuity per m^3 water is the highest for table grapes, followed by citrus and raisins. Potatoes with wheat and wine grapes have a negative annuity.

The ratio of job creation per 1000 m^3 of irrigation water is the highest for table grapes, followed by citrus. The job creation per 1000 m^3 for raisins, wine grapes, potatoes & wheat and tomatoes & brassica seed are all similar and much lower than the other crops. Please note that these figures are identical to the figures for existing irrigation farms and expansion of existing farms, as the water use requirements and employment creation capabilities for the crops remain constant.

3.4.7 Financial Viability of a Small-scale Commercial Farm in Ebenhaeser

The financial viability of a small-scale commercial operation in Ebenhaeser is discussed in this section. The detailed findings are presented fully in the *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018) with a summary below.

A unit size (irrigable area) of 6 ha was used to ensure sufficient scale for viability. The standard farm size in Ebenhaeser is 1.8 ha, however successful farmers lease land from other farmers in the scheme to increase their land area. The model chosen was 3 ha processing tomatoes in the summer and 3 ha brassica seed in the winter. The land area of 6 hectares allow for crop rotation. The choice of crops was due to the tomato processing plant in Lutzville, providing market access and technical support and similarly, Syngenta have a vegetable seed production growing programme in the area providing growing contracts and technical support. Average commercial yields were used – 90 ton/ha for tomatoes and 250 kg/ha for brassica seed.

Initial establishment costs are assumed at R 240 000 for 6 ha, to install in-field drip irrigation (it is assumed that this will be funded through grants). It is also assumed that the farmers will have access to tractors and implements (this could be funded through grants if needed).

The usual measures of profitability, affordability and efficiency are less relevant in this instance, given that a unit of this size would not be commercially viable with this crop combination, without the provision of irrigation infrastructure and access to machinery and equipment. Given that the typical small-scale commercial farmer in Ebenhaeser farms to generate a basic household income, the net monthly cash income was calculated, at R 8 377 per farmer per month.

3.4.8 Summary of findings

In general, the development of new irrigation farms seems to be challenging from a financial viability perspective. Given the reality of relatively profitable existing farming operations in the various regions of the study area, the major contributing factor to lower profit margins seems to be the (expected) relatively high capital cost of the development of new farms and the time taken for new plantings to come into full production.

It is therefore important to note that the expansion of existing irrigation farms will in general be financially more viable than the development of new irrigation farms. The main reasons for this are the cost effectiveness of the improved utilisation of infrastructure on existing farms relative to the costly nature of the development of new farms. For expansion of existing farms, citrus and table grapes currently appear to be profitable, followed by the other crops under certain circumstances. Based on the financial evaluations, the following deductions have been made, which were considered when evaluating options.

Irrigation farming is capital intensive and costly due to, *inter-alia*, the following:

- High-potential irrigation land is relatively scarce and is therefore expensive;
- The upgrading of medium-low and medium potential irrigation soil is a relatively expensive activity;

- The upgrading and development of bulk water infrastructure for irrigation is capital-intensive and is therefore costly;
- On-farm water infrastructure is also costly; and
- The establishment costs for new orchards/vineyards are high.

To produce a high income and offset the high capital- and other costs, high-value crops are produced, predominantly for export markets. These high-value crops however require a high level of technological and managerial inputs, making it difficult for new market entrants. For instance, the financial viability models for new black-owned farms and small-scale commercial farms are based on the yields that commercial growers achieve, but it cannot be assumed that all new black-owned farms will achieve these yields.

The financial viability evaluation also investigated whether agricultural production could be profitable for smallholder (6 ha farms) and commercial water users.

From a commercial perspective, the large-scale production of citrus and table grapes by HDIs on new farms could be profitable in the study area if land is provided at no cost. A possibility exists to develop areas such as the lower Jan Dissels River and Zypherfontein to produce these crops at scale. Raisins, tomatoes, and wheat could also be profitable if high yields are produced.

From a smallholder farming perspective, it was found that a 6 ha agricultural unit in Ebenhaeser could potentially provide the farmer with an income of over R 8 000 per month, if irrigation infrastructure and implements are covered by grants and the growers possess the inputs, skills, and expertise to produce commercial-grade yields. It has been assumed that these farmers will only be liable for a very small portion of the total water levy. This finding could also be extrapolated to other areas that may be able to receive new water use allocations, e.g., municipal commonage schemes or other peri-urban or subsistence farming operations, should they similarly be exempt of paying full levies.

4 Socio-Economic Implications

This chapter provides an overview of the socio-economic impact analysis undertaken to measure the nature and magnitude of the socio-economic impacts emanating from the distribution and use of additional water from a raised Clanwilliam Dam.

4.1 Objective and Approach

An analysis was undertaken to evaluate the relevant impacts that could emerge as a result of the irrigation development. The socio-economic impact was separately undertaken for the construction and operational periods.

Partial general equilibrium analysis[4] has been used to quantify the socio-economic impact of the development. The Social Accounting Matrix (SAM) provides the basis for this partial general economic equilibrium analysis. In general, apart from information on the interdependence between the different sectors taken up in the Input-Output Table, the SAM differs from the traditional Input-Output Table in one important aspect, in that it includes detailed information on the income and spending patterns of households. For the purposes of conducting the partial general socio-economic equilibrium analysis, the SAM has been converted into a user-friendly model. This is a detailed econometric model that is generally used for purposes of measuring the socio-economic impacts resulting from a specific project.

The socio-economic impact model used to calculate the impact of the project on the South African economy uses the South African National SAM as its database. The South African SAM was originally compiled by Statistics South Africa and has been adapted and updated to reflect the most recent socio- and macro-economic representation of the South African economy in a monetary value format.

[4] **Partial equilibrium** is a condition of economic equilibrium which takes into consideration only a part of the market to attain equilibrium.

The largest impact comes from the additional water supplied by the proposed project (baseline plus buffer water). To calculate the socio-economic impact, unit volumes are converted into potential production capacity using water use/production coefficients (Rand / million m^3).

The impacts of economic interventions of the project are measured in terms of economic and socio-economic performance indicators such as:

- GDP (value added to the national economy),
- Employment creation (creation of new jobs for skilled, semi-skilled, and unskilled workers),
- Capital utilization (investments in machinery, transport equipment, buildings, and other social and economic infrastructure),
- Income generated for low-income households (incremental income available to low-income households) as a specific measure of poverty alleviation,
- Fiscal Impact (contributions to Government Revenue), and
- Social Indicators (i.e., the number of additional educators; the number of additional beds serviced at hospitals; the number of additional doctors; the number of additional low-cost houses that can be built; etc.).

The results of the construction phase are first presented, followed by the benefits obtained during the operational phase of the "new" water and the additional benefits in the existing irrigation because of the improved Assurance of Supply volume security.

The calculations and findings have been documented in the *Socio-economic Impact Analysis Sub-Report* of this study.

4.2 Input data

Several guidelines were taken into consideration in the decision of identifying a specific crop allocation for a specific area. The following provides a summary of the guidelines used:

- Is the proposed crop already produced in the area and is packing and marketing infrastructure available? This specifically applies to available support structures like pack houses and management, as the availability of the structures will lower production costs.
- What is the medium to long term price structure outlook for the specific product? This applies specifically to wine grapes as the long-term outlook is not very positive.
- The export of citrus appears very positive and as such provision is made for oranges, lime and lemon, and soft citrus varieties in Zone 2, Clanwilliam Dam to Bulshoek Weir.
- The export of raisins is currently very positive and the medium to long term outlook is positive.
- Significant allowance has been made for table grapes, because of the very negative outlook of wine grapes, but this may change in future.

- Marketing infrastructure for tomatoes is available.
- The potato and wheat in rotation is used as the preference crop in a very specific area, according to recommendations relating to soils.
- The 'other fruit' group has the possibility for the expansion of the sub-tropical or deciduous groups that are produced in the area.
- In the baseline scenario, the long-term projected tonnage per hectare was determined for water provided at an 80% assurance of supply at 2018 prices, to determine an income per crop. The individual budgets for the orchard crops make provision for establishment in year one, up to full production in the appropriate year, with an estimated lifetime of 30 years.
- **Table 4-1** presents the estimated number of hectares per crop, for each study zone, based on the preliminary hectares of new irrigation that can be developed when Clanwilliam Dam has been raised. Although this area was later refined, it did not change much (by 3% from 6 062 ha to an estimated 5 874 ha).
- The long-term projected tonnage per hectare was determined for water provision at an 80% assurance of supply, at 2018 prices to determine an income per crop. The individual budgets for the orchard crops make provision for the establishment in year one up to full production in the appropriate year, with an estimated lifetime of 30 years.

Table 4-1: Estimated crop areas by zone

Crop Type	Zone 2	Zone 4	Zone 5	Totals	Percentage
Citrus	1 370	0	0	1 370	23%
Table Grapes	822	2 144	116	3 082	51%
Wine Grapes	0	0	162	162	3%
Dry Grapes (Raisins)	0	658	46	704	12%
Potato/Wheat in Rotation	466	0	0	466	8%
Tomatoes	0	0	134	134	2%
Other Fruit	82	57	5	144	2%
Total hectares	2 739	2 859	463	**6 062**	**100%**

4.3 Construction Phase Results

Although the construction phase is for a relatively short period of the proposed Right Bank Canal it is still necessary that it be analysed and interpreted. The results are presented as a total for the construction period, the so-called Baseline Option A in the first table, Error! Reference source not found. and for the Total Option B if the "betterment" option is added and implemented in **Table 4-3.**

In the analysis the term gross domestic product is used referring in this specific case to the national economy, where necessary reference will be made to the provincial economy. The same apply to the Balance of Payments.

Table 4-2: Socio-Economic Impacts of the Baseline Option

Criterium	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R103	R117	R109	**R328**
Impact on capital formation [R million]	R703	R426	R306	**R1435**
Impact on employment [number of job opportunities]	362	340	273	**975**
- Skilled impact on employment [number of job opportunities]	38	97	60	196
- Semi-skilled impact on employment [number of job opportunities]	278	142	127	546
- Unskilled impact on employment [number of job opportunities]	46	102	86	233
Impact on Households [R million]				**R261**
- Low Income Households [R million]				R21
- Medium Income Households [R million]				R51
- High Income Households [R million]				R189
Fiscal Impact [R million]				**R99**
-National Government [R million]				R68
-Provincial Government (Rm)				R3
-Local Government (Rm)				R28
Impact on the Balance of Payments [R million]				**R-108**

A survey of the above table shows that the construction period will provide positive impacts, but for the Balance of Payments[5] a negative value of R 108 million for the construction period is forecasted. A total of 975 jobs will be created during the construction period of which 362 will be directly employed in the construction area. A total of R 261 million will be paid to households with R 21 million to Low-Income Households.

[5] The **balance of payments** (**BOP**) is a statement of all transactions made between entities in one country and the rest of the world over a defined period

In **Table 4-3** the results of the construction period plus the "betterment option is presented.

Table 4-3: Socio-Economic Impacts of the Total Proposed Option

Criterium	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R297	R336	R314	**R947**
Impact on capital formation [R million]	R2027	R1229	R881	**R4138**
Impact on employment [number of job opportunities]	1043	981	787	**2811**
- Skilled impact on employment [number of job opportunities]	110	279	174	564
- Semi-skilled impact on employment [number of job opportunities]	800	409	366	1575
- Unskilled impact on employment [number of job opportunities]	132	293	247	672
Impact on Households [R million]				**R751**
- Low Income Households [R million]				R60
- Medium Income Households [R million]				R147
- High Income Households [R million]				R544
Fiscal Impact [R million]				**R286**
-National Government [R million]				R197
-Provincial Government (Rm)				R8
-Local Government (Rm)				R81
Impact on the Balance of Payments [R million]				**R-312**

A survey of **Table 4-3** shows that construction period will provide positive impacts, but for the Balance of Payments a negative value of R 312 million for the construction period is forecasted. A total of 2 811 jobs will be created during the construction period of which 1 043 will be directly in the construction area. A total of R 751 million will be paid to households with R 60 million to Low-Income Households.

The results of the two canal options are compared in **Table 4-4**.

Table 4-4: Comparison of the Socio-Economic Impacts of the Baseline option and the "Betterment" option separated

Criterium	Baseline Impact	Impact "betterment Option Included
Impact on Gross Domestic Product (GDP) [R million]	R328	**R947**
Impact on capital formation [R million]	R1435	**R4138**
Impact on employment [number of job opportunities]	**975**	**2811**
- Skilled impact on employment [number of job opportunities]	196	564
- Semi-skilled impact on employment [number of job opportunities]	546	1575
- Unskilled impact on employment [number of job opportunities]	233	672
Impact on Households [R million]	**R261**	**R751**
- Low Income Households [R million]	R21	R60
- Medium Income Households [R million]	R51	R147
- High Income Households [R million]	R189	R544
Fiscal Impact [R million]	**R99**	**R286**
-National Government [R million]	R68	R197
-Provincial Government (Rm)	R3	R8
-Local Government (Rm)	R28	R81
Impact on the Balance of Payments [R million]	**R-108**	**R-312**

The following is observed during the construction period if the Baseline option is compared with the option where the "betterment" is included:

- The GDP increased from R 328 million to R 947 million for the period,
- Capital formation increased from R 1 435 million to R 4 138 million,
- Employment opportunities improve from 975 to 2 811 which also increases the impact on the people from 4 000 to 11 200 in the different households if 4 is accepted as the number of dependents per job opportunity,
- Salaries and wages increase from R 261 million to R 751 million per annum for the construction period, and
- The only negative value is the increased negative impact on the Balance of Payments from R 108 million to R 312 million.

It is therefore possible to deduct that the possible decision to include the "betterment" option will have a very positive impact during the construction period. On a more practical level, it will improve the delivery of the water by significantly reducing losses. It will also provide greater security against canal failures as there are an ever-increasing threat due to the age and state of the current canals.

4.4 New Areas - Operational Phase Results

In **Table 4-5** below the results as obtained from the model is presented. It is the projected results at a point where all the new areas are fully operational, and the orchards are in full production. Below the table a detailed discussion is provided about the interpretation of the results.

Table 4-5: Socio-Economic Impacts of the Operational Phase

Criterium	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R1072	R687	R915	**R2674**
Impact on capital formation [R million]	R365	R1892	R2637	**R4893**
Impact on employment [number of job opportunities]	10924	2082	2305	**15310**
- Skilled impact on employment [number of job opportunities]	691	486	487	1665
- Semi-skilled impact on employment [number of job opportunities]	3837	1022	1063	5923
- Unskilled impact on employment [number of job opportunities]	6396	573	754	7723
Impact on Households [R million]				**R2131**
- Low Income Households [R million]				R309
- Medium Income Households [R million]				R658
- High Income Households [R million]				R1164
Fiscal Impact [R million]				**R766**
-National Government [R million]				546
-Provincial Government (Rm)				R20
-Local Government (Rm)				R201
Impact on the Balance of Payments [R million]				**R1310**

4.4.1 Gross Domestic Product (GDP)

The definition of Gross domestic product (GDP) states that it is a monetary measure of the market value of all the final goods and services produced in a specific time, often annually. In this specific situation it presents the projected value when the production is fully developed. In this specific case the GDP refers to the impact on the provincial economy, the difference between the national and provincial is very small, less than 2%.

The total projected GDP is estimated to be around R2 674 million per annum, expressed in 2018 prices, with the direct component estimated at R1 072 million, the indirect at R687 million and the induced at R915 million.

Figure 4-1 shows the percentage distribution of the GDP between the three different components. It is also necessary to keep in mind that the products will nearly all be transported to Cape Town for either marketing purposes of export. The accompanying economic impacts are included in the results.

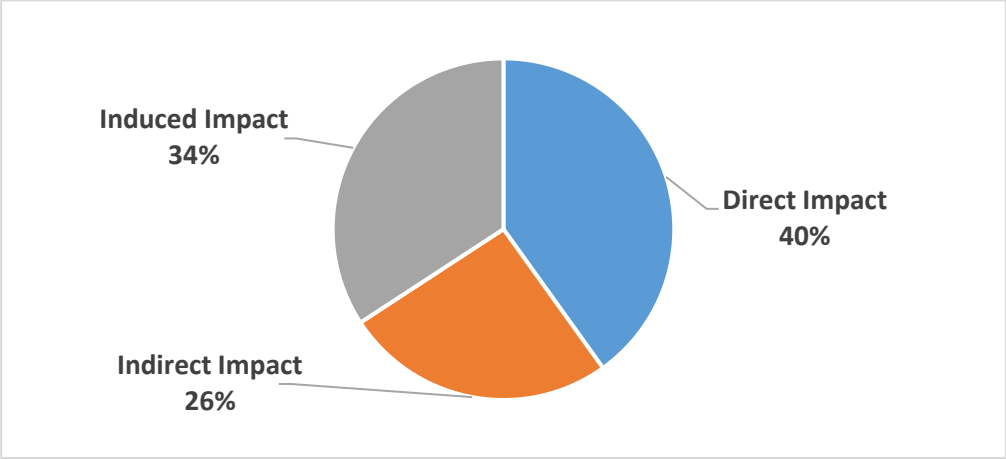

Figure 4-1: Percentage Distribution of GDP (2018 prices)

4.4.2 Capital Creation

Capital formation is crucial element for economic growth. Capital formation increases investment which stimulates economic development in two ways:

- Firstly, it increases the per capita income and enhances the purchasing power which, in turn, creates more effective demand.
- Secondly, investment leads to an increase in production.

The following capital is created in the different segments per annum:

- Direct – R365 million;
- Indirect – R1 892 million;

- Induced – R2 637; and
- With a total of R4 894 million annually.

4.4.3 Employment Creation

The employment numbers are presented as direct, indirect, induced and as skilled, semi-skilled and unskilled.

The following table, Table 4-6: Number of Employment Opportunities, presents the estimated employment numbers.

Table 4-6: Number of Employment Opportunities

Impacts	Number of Jobs
Direct Impact	10 924
Indirect Impact	2 082
Induced Impact	2 305
Total Impact	**15 310**

Figure 4-2 presents the potential job opportunities in the percentage per category.

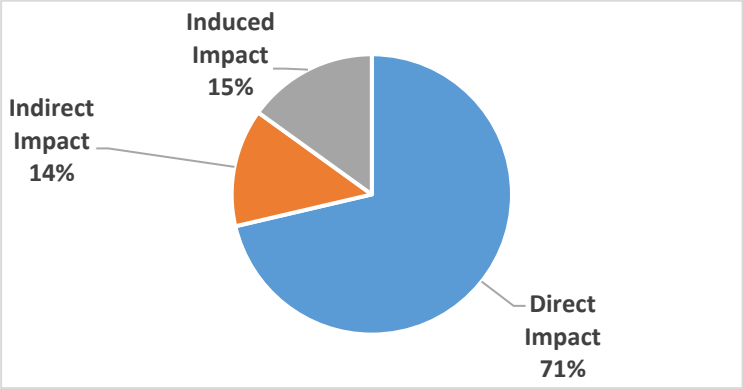

Figure 4-2: Potential Job Opportunities that can be created

The figure show that, in terms of job creation, over 71% is in the direct category, with a much smaller percentage in the other two categories. In total, 15 031 opportunities can be created and supported, of which 10 924 in the direct category will be in the area and on the farms. It can also be accepted that a percentage of the other two categories will also in the feeder area.

Table 4-7 shows the number of jobs at different skill levels that can be created and supported by the proposed new irrigation development.

Table 4-7: Impact on Employment Skills

Impact on employment	Total Impact
- Skilled	1 665
- Semi-skilled	5 923
- Unskilled	7 723
Total	15 310

The table shows that 1 665 of the opportunities to be created will be in the skilled category with the rest in the other two categories, 5 923 semi-skilled and 7 723 unskilled. **Figure 4-3** provides an indication of the skill categories of the number of jobs created per category.

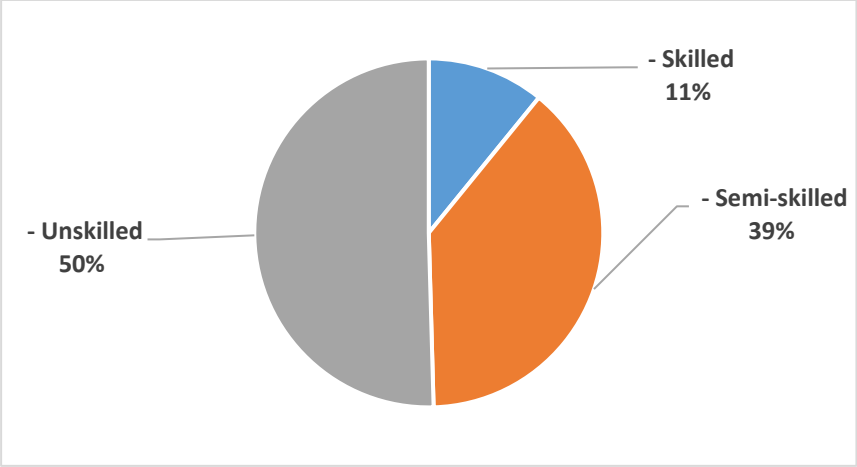

Figure 4-3: Employment Opportunities created per Skilled Category

The graph indicates that only 11% of the potential jobs will be in the skilled category, with 39% in semi-skilled with 50% unskilled.

4.4.4 Fiscus Payment – Social Impact

The total payments to the Fiscus, in terms of different forms of tax at current rates is estimated at R766 million per annum estimated at 2018 prices. The individual tax elements are the National Government, Provincial Government and Local Government.

To provide an estimation in economic terms what the National Tax of R 766 million is worth, it is expressed in social values.

In the data below an indication is given of the extent to which the social services of South Africa can be improved by the additional government income emanating from the taxes. These figures are calculated by assuming that a sizeable portion of this additional government income will be

allocated to social services. It should be noted that the social services indicators depicted below are not mutually exclusive but should be considered in tandem.

Government income will increase, on average, by R 766 million per annum. If this amount is translated into social services, by using the social expenditure portion of the current budget, it can support all the following increases in social services in one year:

- Additional educators: 194;
- Additional hospital beds serviced: 42;
- Additional doctors: 9; and
- Additional low-cost houses built: 64 per annum, which accumulates to over 1270 over a 20 period.

When undertaking projections of this kind, it is important to note that the total cost to government to employ, for example, one teacher, must be considered - that is, not only the educator's remuneration package, but also all the other costs related to supporting the educator standing in front of a class (i.e., furniture, school buildings, administrative support, etc.). Thus, total government expenditure on education is divided between the total numbers of educators employed. The figures reflected above thus make provision for all direct and indirect costs associated with each of the social indicators investigated.

A second issue that must be highlighted is that the estimated investment for the baseline option is R725.04 million and for the “betterment” option R1 239.05 million expressed in 2018 prices, but the projected taxes that will be paid to the Fiscus estimated at R766 million per annum for the duration of the production period.

4.4.5 Impact on Households

One of the crucial aspects of any socio-economic impact assessment is poverty alleviation. The extent to which poverty alleviation is achieved is measured by the impact on household income, specifically the extent to which low-income households will be affected by the available water of the Clanwilliam Dam. **Table 4-8** shows the total annual impact of the expected wages to be paid to the households, with a total of R 2 131 million annually, expressed in 2018 prices.

Table 4-8: Annual Payments to Households

Impact on Households	Total Impact Rand Million
- Low Income	R 309
- Medium Income	R 658
- High Income	R 1 164
Total	**R 2 131**

It is estimated that 14% (see **Figure 4-4**) of the total household income generated will flow to low-income households. Households represent an important agent of the economy, due to their Income and Expenditure patterns. It is important to note that people as economic agents are classified as households in terms of national accounts.

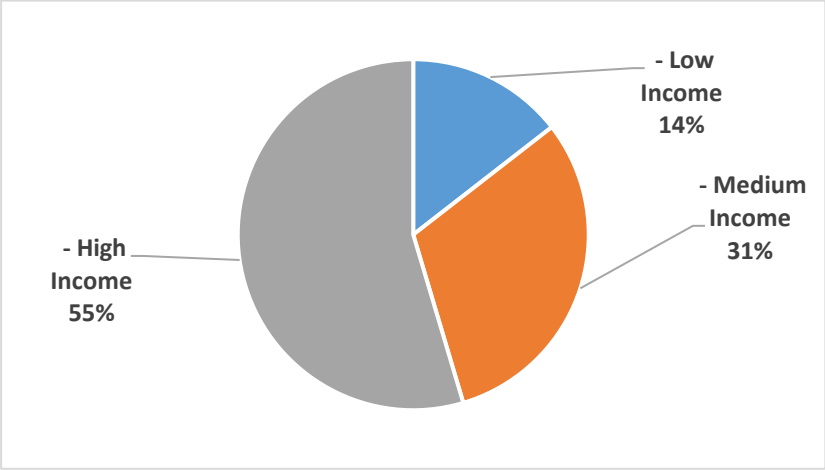

Figure 4-4: Percentage division of Payments to Households

4.4.6 Impact on Balance of Payments

As a large percentage of the crops is exported, a very positive impact is realised on the Balance of Payments of the Treasury, namely R1 310 million annually, expressed in 2018 prices.

4.4.7 Effectiveness Impacts

Table 4-9 provides an indication of the effectiveness criteria of the operational phase compared to investment in other activities. The criteria used is the following:

- GDP/Capital ratio comparing the impact of the capital investment on the resultant GDP;
- Labour/Capital ratio comparing the number of labour opportunities created with the capital invested, number per million Rand used; and
- Low/Total Household Income ratio comparing the income received by the low-income household versus the total household income.

The following table presents the comparison for the different economic activities per million Rand.

Table 4-9: Comparison of the Effectiveness Criteria of different Activities

Criteria	GDP/Capital Ratio	Labour/Capital Ratio	Low/Total Income Households Ratio
Theme Results	0.55	3.13	0.14
Comparative Sectoral Results			
Agriculture, hunting, forestry and fishing	0.28	1.59	0.09
Mining and quarrying	0.79	1.65	0.09
Manufacturing	0.37	0.93	0.08
Electricity, gas and water supply	0.23	0.28	0.07
Construction	0.51	1.60	0.07
Wholesale and retail trade	0.56	1.46	0.09
Transport, storage and communication	0.31	0.61	0.09
Financial, insurance, real estate and business services	0.38	0.85	0.08
Community, social and personal services	0.24	0.80	0.09
Total	**0.37**	**0.96**	**0.08**

The following can be deduced from the table:

- In terms of the GDP/Capital ratio it is only the mining and retail sectors that have a better ratio value,
- In the Labour/Capital ratio the proposed irrigation expansion creates in terms of capital by far the most jobs, and
- In the Low/Total Household Income ratio the proposed activities also outperform the other sectors in terms of the percentage money paid to the low-income households.

4.5 Results of the Increased Assurance of Supply on Existing Production

The results discussed in this section is an indirect result of the improved Assurance of Supply of water which will reduce the water restriction period considerably. In **Table 4-10** the results of this long-term average improvement of the socio-economic conditions in the region is presented by the higher Assurance of Supply of the irrigation water for the existing producers.

Table 4-10: Improved Socio-Economic Impacts of the Operational Phase (2018 prices)

Impact type	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R245	R150	R206	**R601**
Impact on capital formation [R million]	R0	R401	R595	**R995**
Impact on employment [number of job opportunities]	3635	457	519	**4611**
- Skilled impact on employment [number of job opportunities]	0	105	109	214
- Semi-skilled impact on employment [number of job opportunities]	0	228	239	467
- Unskilled impact on employment [number of job opportunities]	3635	125	170	3930
Impact on Households [R million]				**R650**
- Low Income Households [R million]				71
- Medium Income Households [R million]				152
- High Income Households [R million]				256
Fiscal Impact [R million]				**R171**
-National Government [R million]				122
-Provincial Government (Rm)				4
-Local Government (Rm)				45
Impact on the Balance of Payments [R million]				**R328**

The results depict a projected improvement attained over the 14 000 hectares currently irrigated per annum. Thus, an increased water assurance of supply provides the farmer more security for sustainable farming. This higher assurance level provides the farmer the opportunity to optimise his farming operations. It does not only provide a higher annual yield, but also results in the retention of the temporary labour force that is included in the number of job opportunities. The 3 635 unskilled labourers shown in **Table 4-10** will benefit most, as they now have better chance of a longer employment period.

4.5.1 Gross Domestic Product (GDP)

The total projected improved GDP is estimated to be around R 601 million per annum, expressed in 2018 prices, with the direct component estimated at R 245 million, the indirect at R 150 million and the induced at R 206 million.

Figure 4-5 shows the percentage distribution of the GDP between the three different components. It is also necessary to keep in mind that the products will nearly all be transported to Cape Town for either marketing purposes of export. The accompanying economic impacts are included in the results.

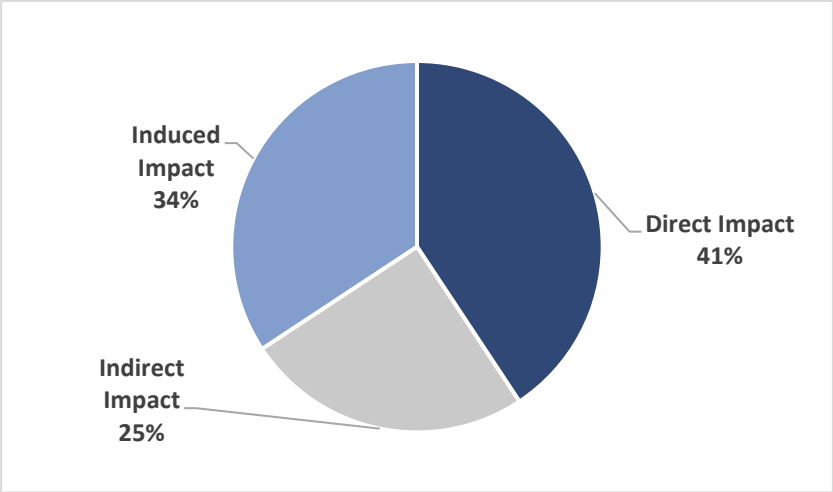

Figure 4-5: Percentage Distribution of GDP (2018 prices)

The figure shows that the impact on the wider economic sectors in terms of the Indirect and Induced impact is 66%, with the direct impact 34%.

4.5.2 Capital Formation

The operational activities will also create new capital, which is an important driver of economic growth. The following capital is created in the different segments per annum:

- Direct – R0.0 million,
- Indirect – R401 million,
- Induced – R595, and
- With a total of R996 million annually.

The assumption was that the in case of the direct component the capital was already being spend and in the case of a restrictions mostly lost.

4.5.3 Employment Impact

The employment numbers are presented as direct, indirect, induced and as skilled, semi-skilled and unskilled.

Table 5-11 presents the estimated employment secured numbers in terms of the specific category.

Table 4-11: Number of Employment Opportunities

Impact on employment [number of job opportunities]	Direct	Indirect	Induced	Total
- Skilled impact on employment [number of job opportunities]	0	105	109	214
- Semi-skilled impact on employment [number of job opportunities]	0	228	239	467
- Unskilled impact on employment [number of job opportunities]	3635	125	170	3930
Total	**3635**	**458**	**518**	**4611**

Table 5-11 shows that in total 4 611 opportunities is secured of which 3 635 is in the unskilled component in the area component which probably is workers whose jobs is now more secured on average than before. The others are probable not directly involved in the area but will still benefit from a more secure work environment.

4.5.4 Impact on Low Income Households

Table 4-12 shows the improved impact household income of the improved Assurance of Supply of the irrigation water from the project.

Table 4-12: Impact on Households

Impact on Households	Rand Million
- Low Income Households	71
- Medium Income Households	152
- High Income Households	256
Total	**650**

The table shows that R 650 million in total is more secure to households under the new assurance than before, R 71 million is aimed at the low-income households which were probably the workers that lost their employment in larger numbers.

4.5.5 Balance of Payments

According to estimations the average annual increase in the Balance of Payments will amount to R 328 million per annum.

4.6 Main Findings and Key Issues

The socio-economic impact analysis for both the Western Cape Province and South Africa indicate that both will be significantly positively impacted by the construction and operation of the water distribution project. In the operational phase it is not only the new water users that benefit

but also the present users, but this benefit will only accrue after construction of infrastructure, establishment of crops and maturing of crops to full production.

Because the dam is situated in the Western Cape, the construction and operation of the dam will have a significant impact on the economy of this province. The following benefits are important for the country during the operational period flowing from the new producing areas:

- GDP will increase, on average, by R 2.764 billion per annum,
- Employment will increase by 15 310 jobs in total over the period mostly in the Western Cape Province,
- Household income will increase, on average, by R 2.131 billion per annum, of which 14% will accrue to low-income households, and
- Government income will increase, on average, by R 766 million per annum. If this amount is translated into social services, by using the social expenditure portion of the current budget, it produces the following increases in social services per annum, all the services listed:
  - Additional educators: 194,
  - Additional hospital beds serviced: 42,
  - Additional doctors: 9, and
  - Additional low-cost houses built: 64 per annum, which accumulates to 1270 over a 20-year period.

A second issue to highlight is that the estimated investment for the baseline option is R725.04 million and for the “betterment” option R 1 239.05 million expressed in 2018 prices, but the projected taxes that will be paid to the Fiscus estimated at R 766 million per annum for the duration of the production period expressed in 2018 prices.

The benefits to the Provincial and National Governments from the increased assurance to the present producers are:

- Total Average GDP increase – R 601 million per annum;
- Number of jobs secured – 4 611. These are people that will have a higher job security;
- Average Increase in Household Income – R 171 million per annum; and
- Average annual stabilising impact of the increase in Balance of Payments is R 328 million.

From the above analysis it appears that the availability of the additional water will have a substantial positive impact on the social and economic conditions prevailing in the area and that poverty alleviation will be substantial in the area.

5 Right Bank Canal Scheme Cost Analysis

This Chapter describes the economic modelling exercise that quantified the risk of failure of the existing left bank main canal up to Verdeling, and the determination of the economic viability of the proposed new right bank canal, to reduce the risk of failure, as described in the *Right Bank Canal Cost Analysis Sub-Report*.

5.1 Objective and Approach

This socio-economic evaluation aimed to quantify the risk and implications of failure of the existing left bank main canal, from the Bulshoek Weir to Verdeling where the canal bifurcates (Trawal section of the LORGWS), to provide additional motivation for the Betterment cost component of the Right Bank Canal Scheme.

The Right Bank Canal Scheme and associated costs have been described in the Right Bank Canal Feasibility Design Sub-Report.

5.2 Risks and Challenges

There is a big difference in engineering standards to which the existing left bank main canal was built, as opposed to current accepted standards. Construction standards were not up to today's standards and lining of the canal e.g., mostly consisted of hessian cloth plastered over by hand. The age of the infrastructure, plus the inadequate standards (e.g., lack of service roads and cross-drainage) are reasons why revamping/replacing of the infrastructure is significantly overdue.

After more than 90 years of usage, the concrete lining of the canal has become frail and prone to damage, which results in canal breaks occurring frequently. The frequency and severity of these breakages seems to be worsening. The canal systems have been in use for significantly longer than its design life. Design standards typically note the useful economic "life" of canals as 45 years - the canals are now twice that age.

The very poor state of canal infrastructure poses a high risk to the regional community and economy, due to the disruption, periods of non-supply (including supply to towns, industries, and mines), and associated commercial and cost implications. The largest break happened in

January 2015 (**Figure 5-11**) with a repair cost of R11.5 million, which cost the agriculture sector an estimated R100 million (Creamer Media, 2017).

The LORWUA reported (J Matthee 2018, personal communication) that it spends approximately R 4.2 million per annum on normal maintenance with its own teams, and contracts out approximately R 5.8 million per annum on more serious repairs. Breakages on the current main canal poses the biggest risk, as all downstream water users, which represents most scheme users, are affected.

Figure 5-1: Lower Olifants Canal break in 2015

There is excessive conveyance water losses and leakage from the existing canals, estimated by DWS to be up to 30% by DWS, compared to less than 10% for a new canal. The flow capacity of the existing canals is also restrictive and often cannot meet the peak demand, especially during the very hot, peak summer period.

5.3 Betterment Infrastructure Works

Betterment implies an improvement of existing (hard) water resource infrastructure, resulting in an increased functional performance and/or increased capital value thereof. A distinction is made between types of expenditure on existing works during their working lives, namely maintenance,

refurbishment, betterment, etc. This also determines how certain charges will be levied, and who will take responsibility for its undertaking. Betterment works for the scheme have long been planned for by the owner of the scheme, DWS, as well as the operator, LORWUA. Financial constraints have significantly delayed the implementation of the more significant betterment works that are needed.

5.4 Methodology

The approach used is to quantify the macro- and micro-economic impact associated with the mitigation of the risk of failure of the existing main canal (Trawal section) of the LORGWS by constructing a right bank canal (the Right Bank Canal Scheme) to replace the existing main canal from Bulshoek Weir to Verdeling.

The proposed construction consists of the following two development scenarios, to be compared following financial and economic viability evaluation:

- **Scenario 1: Right Bank Canal:** Construction of a Right Bank Canal to serve the four recommended Trawal irrigation areas, existing irrigators, and other future water users.
- **Scenario 2: Alternative - Left Bank Canal:** Construction of two small bulk water supply schemes to serve the four recommended Trawal irrigation areas, existing and future water users, and refurbishment of the remainder of the existing left bank main canal.

A Cost Benefit Analysis (CBAn) approach is used to calculate the micro-economic feasibility of the project by comparing the costs versus the benefits, and thereby establishing the financial and economic feasibility of the development scenario.

The CBAn consists of two separate analyses:

- Firstly, the analysis of the possible schemes and betterment works that can supply the four identified irrigation areas at Trawal, to determine the financial and economic feasibility of the system for the scenarios.
- Secondly, the financial and economic feasibility of the two scenarios is compared to support a recommendation in terms of financial and economic terms.

A SAM-based econometric model was applied to estimate the social and macro-economic impacts of the Trawal irrigation development as well as the impact on a local, regional, and national level.

5.5 Costs and Implementation Programmes

Table 5-1 presents the estimated costs of the two small schemes to supply water to the four Trawal identified areas, which forms part of Scenario 2.

Table 5-1: Costs of two small schemes

Capital Cost Components	Cost (R million)
New high-level canal	122.7
Pump stations	153.04
Pipelines and syphon	83.86
Farm Dams	27.42
Canal raising: 8km of existing main canal	3.92
Cost of lining: 8km of existing main canal	45.61
Land purchase cost	66.32
Consulting fees	70.29
Total cost	**R 573.16**

The estimated capital construction cost to develop the two small bulk water development schemes to provide water to the Trawal irrigation areas is R 573.16 million, expressed in 2020 prices.

The development and betterment costs for the two scenarios are presented in **Table 5-2**. Note that the development component is the same for both scenarios below, as it has been assumed to be equal to the cost of the two small schemes to supply the four new Trawal irrigation areas. Should the Right Bank Canal not be constructed however, the two small supply schemes would instead be constructed.

Table 5-2: Development and Betterment costs of the two development scenarios

Main canal long-term alternative	Development Component	Betterment Component	Total Cost	Construction Period
Two small schemes and upgrading of left bank main canal	R 573.16	R 1 436.41	R 2 009.57	18 years
Right Bank Canal Scheme	R 573.16	R 1 421.50	R 1 994.66	4 Years

It is estimated that the right bank canal will be constructed over a 4-year period. The two small supply schemes will be constructed over 3 years and the betterment of the remainder of the main left bank canal will be implemented thereafter, over a 15-year period.

The capital cost for the Alternate Left Bank Scenario is R 819.66 million, if expressed as present Value, while the right bank canal costs, if expressed in present value is R 1 177.05 million. From this it appears that the Alternate Left Bank Scenario is the preferable scenario, however this does not take the contribution of the possible significant benefits and the extended negative impact of

the canal breaks and water supply restrictions into consideration. Also, the additional water available from the raised Clanwilliam Dam will only be properly utilised after 18 to 20 years for the Alternate Left Bank Scenario compared to the 8-to-10-year period for the Right Bank Canal Scenario.

5.6 Impact of Restricted Water Supply and Canal Breaks

An analysis was done of the current crops produced in the lower Olifants River valley and the production budgets, expressed in 2020 prices. An analysis is also provided of the impact of the water restriction during the latest drought period as well as the estimated losses suffered during canal breaks.

Table 5-3 provides the estimated losses suffered during the recent drought period for grape-based products. This provides an estimation of the financial impact on the producers as well as the farm labour and even the impact on the urban areas.

Table 5-3: Losses by producers during recent drought period

Crops	Baseline	Drought Year		Post Drought			
	2016/17	2017/18		2018/19		2019/20	
	Yield	Yield	% Change	Yield	% Change	Yield	% Change
Wine grapes (t/ha)	22,6	19,8	-12%	17,2	-24%	23,7	5%
Raisins (total tonnes)	7 800	5 800	-26%	6 500	-17%	11 000	41%
Table grapes (total 4,5kg export ctns)	3 968 073	2 802 436	-29%	2 366 503	-40%	3 319 516	-16%

Table 5-4 presents the estimated percentage loss suffered by producers, for different period of breaks in water supply.

Table 5-4: Losses by producers during different breaks in water supply

Duration of break	Wine Grapes & Raisins		Table Grapes	
	Year 1 loss	Year 2 loss	Year 1 loss	Year 2 loss
30 day water break	50%	20%	55%	25%
3 month water break	60%	40%	65%	45%

From **Table 5-3** and **Table 5-4** it is obvious that the drought restriction has a very negative impact on the grape-based crop production, not only in terms of physical yields but also financially. As

all three crops are also exported on a large scale, the country also suffers because of a drop in the balance of payments.

The impact on summer and winter vegetable production has also been addressed.

5.7 Social and Economic Conditions in the Cederberg and Matzikama Local Municipalities

A detailed analysis is provided of the current social and economic conditions in the two local municipalities. The latest available data show the dependence of these two local municipalities on irrigated agriculture. In the case of the Cederberg Local Municipality 42.6% of the people employed are active in the agricultural sector and 39.7% for the Matzikama Local Municipality.

Both municipalities have large numbers of indigent households, and unemployment is relatively high with large numbers of part-time employees.

The main deduction from the analysis is that the future growth of the economy of the two municipalities will depend on increased irrigation development.

5.8 Financial and Economic Viability and Macro-Economic Impact

To determine the financial and economic feasibility of the development (termed 'the project'), a comprehensive Cost Benefit Analysis (CBAn) econometric modelling approach was used, with the following three models being developed:

- Constant Price Financial CBAn Model with an 8% discount rate – constant prices;
- Current Price Financial CBAn Model with an 11.28% discount rate – nominal prices at 4.5% annual inflation; and
- Constant Price Economic CBAn Model with an 8% discount rate – market (shadow) prices.

The three indicators used are:

- Net Present Value (NPV) >0;
- Internal Rate of Return (IRR) > Discount Rate; and
- Benefit Cost Ratio (BCR) >1.

A project must satisfy all three indicators to be recommended for implementation.

The macro-economic impacts were determined with a partial equilibrium model, based on the Western Cape Provincial SAM, to estimate the macro-economic impact contribution of a specific scenario.

5.9 Current Production and Future Assumptions

A detailed analysis was performed to identify the current crops being produced, the profitability of these crops, and the outlook for a selection of specific representative crops. All the crops currently produced require intensive management and have high input costs. The availability of effective marketing channels also plays an important role in the selection of the specific crops.

Table 5-5 presents the existing production, but keep in mind that the situation is very dynamic and continuous changes are taking place. According to information received from SAWIS, the area under wine grapes declines by about 130 hectares per annum and is mostly replaced by table grapes and raisin varieties.

Table 5-5: Production below Bulshoek Weir by Crop Type

Crop type	Sub-Area 4 and 5-Bulshoek Weir to Lutzville (hectares)	Percentage
Peaches	100	0.80%
Table grapes	880	7.04%
Wine grapes	8 389	67.11%
Dry Grapes (Raisins)	1 300	10.40%
Summer Vegetables	811	6.49%
Tomatoes Industrial	350	2.80%
Tomatoes Fresh	186	1.49%
Winter Vegetables	485	3.88%
Total	**12 501**	**100.00%**

Some changes in the crop composition were assumed, based on the current and future price structures, and after considering the different scenarios. **Table 5-6** presents the existing crop structure and the adapted percentages used in the analysis.

Table 5-6: Existing crops vs. crops analysed

Crop type	Current Percentage	Adapted Percentage Used
Peaches	0.80%	0.00%
Table grapes	7.04%	11.17%
Wine grapes	67.11%	44.66%

Crop type	Current Percentage	Adapted Percentage Used
Dry Grapes (Raisins)	10.40%	20.10%
Summer Vegetables	6.49%	6.70%
Tomatoes Industrial	2.80%	8.04%
Tomatoes Fresh	1.49%	6.70%
Winter Vegetables	3.88%	2.64%
Total	**100.00%**	**100%**

Peaches were removed and wine grapes reduced in line with the current financial and marketing problems. The percentage of table grapes, raisins and tomatoes were increased, as the market for all three products appears to be strong in the coming years.

5.10 Financial and Economic Viability of the Proposed Trawal Irrigation

The four identified potential irrigation areas were analysed against the background that the 2 339 hectares is reserved for the establishment of historically disadvantaged farmers. A second issue analysed is the fact that these farmers will need additional financial and other support, which an existing commercial farmer will not require.

The development construction period is estimated at four years, with the development of the first irrigation area during the second year of construction.

The latest projections are that, if construction starts in Year 1, the following areas can become available for the Right Bank Canal Scenario:

- Year 2: Zypherfontein 1 – 669 hectares;
- Year 3: Zypherfontein 2 – 661 hectares;
- Year 5: Trawal – 554 hectares; and
- Year 5: Melkboom – 455 hectares.

Farm establishment costs were estimated in the: *Financial Viability of Irrigation Farming Sub-Report* together with the *Mechanization Guide 2020* published by JP and ME le Roux and the building costs from the *2020 Building Cost AECOM* publication.

Table 5-7 presents the total estimated farm development costs for the proposed Trawal irrigation areas.

Table 5-7: Trawal Irrigation Area - Farm Unit establishment costs R million, incl. VAT)

Year	2	3	4	5	Total
Sheds	12.36	10.75	5.81	12.20	41.13
Raisin slabs	0.15	0.15	0.15	0.15	0.60
Pack houses	6.00	R6.00	6.00	6.00	24.00
Irrigation and bulk water	95.07	82.73	44.69	93.89	316.38
Tractors/ implements, etc.	41.49	36.11	19.50	40.98	138.08
Total	**R 155.07**	**R 135.74**	**R 76.15**	**R 153.22**	**R 520.18**

The operational costs were calculated in line with “Budgets” for on-farm developments.

Table 5-8 presents the results of the three CBAn models as discussed in Section 5.8.

Table 5-8: Results from the three CBAn Models

Model	Constant Price - Financial	Current Price - Financial	Economic Price
Discount Rate	**8%**	**11,28%**	**8%**
Present Value Benefits (Rand million)	R 6 169.1	R 7 599.6	R 6 169.1
Present Value – Costs (Rand million	R 4 665,1	R 5 518.2	R 4 592.5
Net Present Value (NPV) (Rand million)	R 1 504.02	R 2 081.46	R 1 576.67
Benefit Cost Ratio (BCR)	1.32	1.38	1.34
Internal Rate of Return (IRR)	16.8%	22.2%	17.34%

Table 5-8 shows positive, financially viable results for all three baseline models. A detailed risk analysis was performed making provision for the following:

- Capital costs that can increase up to 40%, for both the canal system and the farm development costs;
- A 20% annual increase for electricity costs; and
- A 10% annual wage increase.

For all three models, the analysis results remain positive, and it is deducted that this section of the project is financially viable.

The macro-economic analysis shows that in total, 2 705 jobs will be directly created, mostly on the farms, of which 84 will be skilled, 281 semi-skilled, and 2 899 unskilled. A large percentage of the unskilled “direct” labour will be part-time, while the skilled and semi-skilled labour will be permanent employees.

The indirect employment created is estimated at a total of 234, and the induced employment at a total of 444.

The total annual amount paid to households is estimated at R 417 million, expressed in 2020 prices. The low-income household share is R 44 million, which is 10.1%, per annum, expressed in 2020 prices.

The total annual taxes paid are estimated at R 154 million, with R 108 million paid to National Government.

The annual estimated impact on the balance of payment is R 259 million, expressed in 2020 prices. It is mostly made up of the exports of table grapes and raisins, with a percentage contribution from wine production.

From the above analysis it is deduced that the Trawal irrigation proposal is financially and economically viable and can be recommended for implementation.

5.11 Comparison of the Financial and Economic Viability of the Right Bank Canal scenario to the Alternative Left Bank scenario

The data used in the different models to determine the financial and economic feasibility of the two scenarios are presented below.

The total new area that can be developed for irrigation below Bulshoek Weir for the Right Bank Canal Scenario is 3 639 hectares, consisting of the 2 339 hectares in Trawal and an additional 1 300 hectares, consisting of:

- Klawer Phase 1: 412 hectares,
- Klawer Phase 2: 438 hectares,
- Coastal flow-restricted: 89 hectares, and
- Ebenhaeser: 361 hectares.

If the Alternate Left Bank Canal Scenario is implemented, the Klawer Phase 2 Scheme might not be developed, due to the lack of canal flow capacity, and the additional area is reduced to 888 hectares, if it is assumed that the extent of canal losses remains at 20%. However, as the canal is lined, the losses will decrease, eventually to the extent that adequate flow capacity can potentially be available to also implement the Klawer Phase 2 Scheme, although this would not be advisable.

The Klawer Phase 2 Scheme can also be developed as the last phased scheme, for the Right Bank Canal Scenario, and additional funds become available for an upgrade or replacement of the Klawer canal section, to service the new irrigation area and other water users.

The following presents the estimated development area per year for the Right Bank Canal Scenario, for all new schemes below Bulshoek Weir:

- Year 2 - Zypherfontein 1: 669 hectares;
- Year 2 - Klawer Phase 1: 412 hectares;
- Year 3 - Zypherfontein 2: 661 hectares;
- Year 3 - Ebenhaeser Restitution and CPA augmentation: 361 hectares;
- Year 5 - Trawal: 554 hectares;
- Year 5 - Melkboom: 455 hectares;
- Year 5 - Coastal 1 flow restricted: 89 hectares; and
- Year 7 - Klawer Phase 26: 438 hectares.

For the Alternate Left Bank Canal Scenario, the following development area was estimated and populated in the model:

- Year 2 - Zypherfontein 1: 669 hectares;
- Year 2 - Klawer Phase 1: 412 hectares;
- Year 2 - Trawal: 554 hectares;
- Year 3 - Zypherfontein 2: 661 hectares;
- Year 3 - Ebenhaeser: 361 hectares;
- Year 4 - Melkboom: 455 hectares;
- Year 5 - Coastal 1 flow-restricted: 89 hectares; and
- Year 13 - Klawer[7] Phase 2: 438 hectares.

The farm development costs were also calculated for the settlement of historically disadvantaged farmers and for application in the CBAn models, as presented below.

The farm developmental costs are presented in **Table 5-9**.

Table 5-9: Right Bank Production Unit Development Costs (R million, incl. VAT, 2020 prices)

Year	2	3	4	5	6	7	Total
Hectares developed per year	1081	1022	0	1098	0	438	3639
Percentage per annum	29.7%	28.1%	0.0%	30.2%	0.0%	12.0%	100.0%
Sheds, etc.	R 31.80	R 30.06	R 0.00	R 32.30	R 0.00	R 12.88	R 107.05
Irrigation and bulk water	R 229.08	R 216.57	R 0.00	R 232.68	R 0.00	R 92.82	R 771.15
Tractors/ implements, etc.	R 128.43	R 121.42	R 0.00	R 130.45	R 0.00	R 52.04	R 432.34
Total	**R 389.31**	**R 368.06**	**R 0.00**	**R 395.43**	**R 0.00**	**R 157.74**	**R 1 310.53**

[6] This will be soonest that Klawer Phase 2 could be implemented.
[7] This will only be possible once the left bank canal has been refurbished

The total farm development cost of R 1 310.53 million, expressed in 2020 prices are the same for both scenarios, but the application of the funds is phased in the relevant CBAn models according to the two different area development programmes.

The production costs are based on the budgets and phased according to the proposed area development. The same applies for the income generated by the development of the new irrigation areas and phased in accordingly. **Table 5-10** presents the CBAn results of the Right Bank Canal Scenario.

Table 5-10: CBAn results of the Right Bank Canal scenario

Parameters	FCBA[8] Constant Price	FCBA Current Price 4.5% Annual Inflation	ECBA Constant Price
Discount Rate	8%	11.28%	8%
Benefit - Present Values (Rand mil.)	R 8 597.85	R 12 418.23	R 8 142.66
Total Costs – Present Values (Rand mil.)	R 8 316.36	R 9 998.77	R 5 396.88
Net Present Value (NPV) (R mil.)	R 281.49	R 2 419.46	R 2 745.78
Benefit Cost Ratio (BCR)	1.03	1.24	1.51
Internal Rate of Return (IRR)	8.8%	13.71%	16.2%

The results of the baseline model present a very positive financially viable result. A sensitivity analysis was performed to show the results, if no additional benefits are realised from the existing producers, as well as different production levels, should the new farmers experience problems to reach expected production levels in the first seven years. The sensitivity analysis shows a very positive set of results (**Table 5-11**).

Table 5-11: Right Bank Canal Scenario Sensitivity Analysis results

Parameters	No Additional Benefits from Existing Area	New Production 10% Short	New Production 15% Short	New Production 20% Short
NPV (R mil.)	R 2 055.59	R 2 390.8	R 1 788.3	R - 476,65
BCR	1.26	1.24	1.18	0.98
IRR	12.2%	11.3%	9.9%	6.52%

[8] FCBA – Financial Cost Benefit Analysis

It is deducted that the Right Bank Canal Scenario is financially viable for the first two risk analyses done, but not if the production yields are more than 15% short.

Table 5-12 presents the results for the Alternate Left Bank Scenario.

Table 5-12: CBAn results of the Alternate Left Bank Canal scenario – Klawer Phase 2 Included

Parameters	FCBA[9] Constant Price	FCBA Current Price 4.5% Annual Inflation	ECBA Constant Price
Discount Rate	8%	11.28%	8%
Benefits – Present Value (Rand mil.)	R 7 973.00	R 10 118.06	R 7 973.00
Total Costs – Present Value (Rand mil.)	R 7 949.32	R 9 380.47	R 7 848.45
Net Present Value (NPV) (R mil.)	R 23.68	R 737.59	R 124.55
Benefit Cost Ratio (BCR)	1.01	1.08	1.03
Internal Rate of Return (IRR)	8.1%	14.0%	8.4%

The results indicate a financially viable scenario. In **Table 5-13**, the sensitivity results of the Alternate Left Bank Canal Scenario are presented.

Table 5-13: Alternate Left Bank Canal Scenario Sensitivity Analysis results

Parameters	No Additional Benefits from Existing Area	New Production 5%short	New Production 10% short
NPV (R mil.)	R 482.00	R 244.47	R - 248.65
BCR	1,05	1,03	0.97
IRR	13.2%	12.2%	10.3%

The results for the Alternate Left Bank Canal Scenario show much more sensitivity than the results for the Right Bank Canal Scenario.

The results show that both scenarios are financially viable in terms of the CBAn results, with the Right Bank Canal Scenario providing much stronger results.

The sensitivity analysis also does not support the Alternate Left Bank Canal Scenario in terms of the different risk factors relating to possible construction cost increases and not reaching maximum production levels, or possible product prices not keeping up with the cost of production inflation.

[9] FCBA – Financial Cost Benefit Analysis

Table 5-14 shows a comparison of the baseline results from the financial and economic CBAn models for both scenarios, indicating the stronger Scenario 1.

Table 5-14: Result Comparison of the Right Bank and Left Bank Scenarios

Parameters	FCBA Current Price 4.5% Annual Inflation	FCBA Current Price 4.5% Annual Inflation	Economic CBAn Constant Market Prices	Economic CBAn Constant Market
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Discount Rate	11,28%	11,28%	8%	8%
Benefit - Present Values (Rand mil.)	R 13 590.76	R 10 118.06	R 8 142.66	R 7 973.00
Total Costs - Present Values (Rand mil.)	R 9 998.76	R 9 380.46	R 5 396.88	R 7 848.44
Net Present Value (NPV) (R mil.)	R 3 592.00	R 737.60	R 2 745.78	R 124.56
Benefit Cost Ratio (BCR)	1.36	1.08	1.51	1.01
Internal Rate of Return (IRR)	16.2%	14.0%	16.2%	8.4%

The macro-economic impact analysis shows that, in total 7 686 job opportunities can be created and supported, of which 6 160 are the direct category and will be in the area and on the farms. It can also be accepted that a percentage of the other two categories will occur in the feeder area.

At least 6 160 jobs will be created in the Cederberg and Matzikama Local Municipality service areas, where social conditions are currently not very encouraging and irrigation activities can add to the improvement of the situation.

Table 5-15 shows the number of jobs that can be created and supported at different skill levels by the proposed new irrigation development of the Right Bank Canal Scenario.

Table 5-15: Jobs created by the Right Bank Canal Scenario

Impact on employment	Numbers
- Skilled	484
- Semi-skilled	1 257
- Unskilled	5 945
Total	7 686

Table 5-15 shows that 484 of the opportunities to be created will be in the skilled category, with 1 257 in the semi-skilled category and 5 945 in the unskilled category.

One of the crucial aspects of any socio-economic impact assessment is poverty alleviation. The extent to which poverty alleviation is achieved is measured by the impact on household income, specifically, the extent to which low-income households will be affected by the successful execution of the project. **Table 5-16** shows the total annual impact of the expected wages to be paid to households, with a total of R 818 million annually, expressed in 2020 prices.

Table 5-16: Impact on expected household wages

Impact on Households	Total Impact (Rand million)
- Low Income	103
- Medium Income	253
- High Income	623
Total	979

As a large percentage of the table grapes, raisins and wine grape products are exported, a very positive impact is realised on the balance of payments of Treasury, namely R 584 million annually, expressed in 2020 prices.

5.12 Do-Nothing Scenario

The two development scenarios have been evaluated against the “Do Nothing” scenario which is the following:

- After the Clanwilliam Dam wall has been raised and the additional water is available, only the new irrigation schemes that make use of the existing spare canal flow capacity can be developed. This means that the right bank canal or alternatively the two small bulk water supply schemes are not constructed. The following schemes are developed for the “Do Nothing” scenario:
  - Year 2: Klawer Phase 1 – 412 hectares;
  - Year 3: Ebenhaeser Restitution and CPA augmentation – 361 hectares; and
  - Year 7: Coastal flow-restricted – 89 hectares.
- Attempt to maintain the current canal system with all its weaknesses, leakages and canal breaks.

The results of the “Do Nothing” scenario would then be:

- Restricted economic development in the lower Olifants River valley as the current left bank canal will not be able to accommodate the new water volumes.

- The available additional water is not properly used.
- Only at schemes that make use of the spare capacity in the existing canals would historical disadvantaged farmers be established and the opportunity to establish or support them on the other areas will not take place.
- Very limited opportunity for poverty alleviation in the area due to restricted development of new irrigation areas.

5.13 Analysis of the Trawal Irrigation Areas

The financial and economic feasibility of developing the four recommended Trawal irrigation areas were established separately. The financial feasibility was established by applying the CBAn approach. A Cash Flow Model was used to determine if farmers will be able to repay any production and farm development loans. The economic feasibility was determined by using a Macroeconomic Impact Model (MEIA).

A detailed investigation was performed to identify the current crops produced, the profitability of these crops, and the outlook of specific crops. Based on this analysis, a specific crop composition was used in the analysis.

The future income of the new areas was phased in the modelling exercise. The capital costs, as well as the production costs were phased in the models.

The results are positive for the CBAn analysis as well as the Cash Flow, in which it is estimated that newly established historically disadvantaged farmers should be able to repay their loans within a period of 10 years. The MEIA also shows very positive results, and the construction of the Right Bank Canal Scheme will make a very positive contribution to the economic growth of the two local municipalities.

Table 5-17 presents the results of the CBAn results, indicating financial viability.

Table 5-17: CBAn Results for the Trawal Area

Model	Constant Price - Financial	Current Price - Financial	Economic Price
Discount Rate	**8%**	**11,28%**	**8%**
Present Value Benefits (Rand million)	R 6 169.1	R 7 599,6	R 6 169.1
Present Value – Costs (Rand million)	R 4 665.1	R 5 518,2	R 4 592.5
Net Present Value (NPV) (Rand million)	R 1 504.02	R 2 081,46	R 1 576.67
Benefit Cost Ratio (BCR)	1.32	1.38	1.34
Internal Rate of Return (IRR)	16.8%	22.2%	17.34%

The results indicate a very positive set of results. The sensitivity analysis undertaken supports the very positive results.

5.14 Comparison of the Two Canal Scenarios

The following presents a summary of the CBAn results for the current price and market price models of the two canal development scenarios:

- Scenario 1: Right Bank Canal Scheme.
- Scenario 2: Alternate Bank Canal Scheme.

Table 5-18 shows that Scenario 1 is preferable in terms of the baseline CBAn results, although both show viable results.

Table 5-18: Comparative CBAn results for the canal development scenarios

Parameters	FCBA Current Price 4.5% Annual Inflation	FCBA Current Price 4.5% Annual Inflation	Economic CBAn Constant Market Prices	Economic CBAn Constant Market
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Discount Rate	11.28%	11.28%	8%	8%
Benefit - Present Values (Rand mil.)	R 13 590.76	R 10 118.06	R 8 142.66	R 7 973.00
Total Costs – Present Values (Rand mil.)	R 9 998.76	R 9 380.46	R 5 396.88	R 7 848.44
Net Present Value (NPV) (R mil.)	R 3 592.00	R 737.60	R 2 745.78	R124.56
Benefit Cost Ratio (BCR)	1.36	1.08	1.51	1.01
Internal Rate of Return (IRR)	16.2%	14.0%	16.2%	8.4%

The findings included in **Table 5-18** show that Scenario 1 presents the stronger financial and economic results, especially in the case of the Economic CBAn.

A detailed risk and sensitivity analysis was also performed, with evaluation of some of the cost items that might increase faster than the projected inflation rate, as well as the possibility that projected income levels may not be attained. This comparison of the sensitivity analysis for the two scenarios is shown in **Table 5-19**.

Table 5-19: Sensitivity Analysis scenarios comparison

Scenarios	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Parameters	**No Additional Production Existing Areas**	**No Additional Production Existing Areas**	**Production 10% Short**	**Production 10% Short**
NPV (Rand mil)	R 2 055.59	R 482.00	R 2 390.8	R - 248.65
BCR	1.26	1.05	1.24	0.97
IRR	12.2%	13.2%	11.3%	10.3%

The benefits in **Table 5-19** show that both scenarios provided positive answers, if no impact of the existing areas are taken into consideration, but the benefits of Scenario 2 are considerably lower than the results from Scenario 1 (Right Bank Canal Scheme).

The second comparison set shows that, if the financial benefits are lower than 15% of the expected results, then Scenario 2 is not viable.

The macro-economic impact analysis shows that the execution of the Right Bank Canal Scheme will introduce considerable positive results in terms of the growth potential of the economy of the lower Olifants River valley, which is an area where economic growth is currently very low. It will also make a large contribution to poverty alleviation in the region, by the number of new jobs created and salary payments to households.

Scenario 1 will also produce economic impacts in the lower Olifants region after 8 to 9 years, while Scenario 2 will probably reach the same level of positive impacts after 18 to 20 years.

5.15 Recommendation

The financial and economic viability analysis undertaken demonstrates that the Right Bank Canal Scenario is recommended as the preferred scenario.

The benefits of implementing the Right Bank Canal Scheme, in comparison with the implementation of the alternative two small water supply schemes and upgrading of the existing left bank canal, are as follows:

a) The Right Bank Canal will be built to current construction standards, with proper freeboard and additional capacity that allows for intra-month flexibility to meet water requirements and therefore improve production. While this, at first, will only be of immediate benefit for water users up to Verdeling, this presents the opportunity for the rest of the system to benefit later when the secondary canals are upgraded.

b) The Right Bank Canal will be more secure against failure than the re-lined left bank canal. In addition, this security will be achieved earlier.
c) The Right Bank Canal will present an opportunity for a subsequent upgrade of the system downstream, extending the benefit of greater flexibility and additional capacity. This in turn, along with the slightly increased capacity, will allow irrigators to plant a higher percentage of permanent crops, especially during the high summer period, with associated socio-economic benefits.
d) There is greater confidence in the estimation of the Right Bank Canal's construction costs and programme. For the upgrading of the left bank canal, the requirement to keep water flowing while construction takes place makes it a complex exercise, beset with operational difficulties and unforeseen issues that can increase costs and are likely to cause delays.
e) The Right Bank Canal Scheme makes provision to meet the future water requirements such as towns, industries, and mines (initially only up to Verdeling, until further canals are upgraded). Upgrading the existing left bank canal does not make provision to meet the future water requirements, especially the potential to eventually increase the supply capacity up to Vredendal.
f) Should the left bank canal be re-lined, new irrigation schemes that rely on the construction of the Right Bank Canal cannot be developed, such as the Klawer Scheme Phase 2, which can be done if the Right Bank Canal Scheme is implemented.
g) There will be significant water savings should the Right Bank Canal be constructed, compared to re-lining the entire left bank main canal. The integrity of the Right Bank Canal will also be better than that of a re-lined left bank canal.

While it is not possible to directly compare all the incremental benefits with the incremental costs, a strong argument can be made for implementing the Right Bank Canal Scheme. The replacement of the current left-bank main canal with a proposed right bank canal of increased capacity is an opportunity to significantly reduce the risk of canal breakage and supply interruptions to water users, to lower water losses, to lower the risk of damage to the regional economy and plan for future water provision.

The Right Bank Canal Scheme provides a unique opportunity to combine long-delayed betterment works more cost-effectively with new development infrastructure. The opportunity to piggy-back on to the scheme is a once-off. If missed, that opportunity will be gone forever.

6 Agricultural Production and Farm Development Analysis

6.1 Objective and Approach

The *Agricultural Production and Farm Development Report* (DWS, 2020) includes the relevant findings of the *Financial Viability of Irrigation Farming Report* (DWS, 2018), but also elaborates further on the inclusion of HDIs in the proposed scheme.

The main objective of this report is to provide clarity on the proposed farming models related to uptake of additional irrigation water. In terms of the principle of Water Allocation Reform (WAR), preference should be given to HDIs when allocation of water is considered. In terms of the previous Clanwilliam Dam Raising Feasibility Study, a target of 75% allocation of new water use entitlements to HDIs has been set. The farming models were developed with this principle in mind. Furthermore, a needs analysis of HDI farmers was done, focusing on the agricultural value chain. This report also includes case studies of both land restitution cases and successful commercial JV projects. A balance needs to be found between commercial sustainability on the one hand, and the needs of HDIs and destitute communities on the other. Both motivations are needed to obtain the buy-in from all relevant Government Departments and ultimately to motivate the funding and financing of the scheme.

6.2 Proposed Farming Models

In the section below, the proposed farming models will be discussed. These farming models were informed by the guidelines as set out in the *Final Report of the Presidential Advisory Panel on Land Reform and Agriculture* (referred to as the *Land Reform Panel Report*), which is the highest authority on land reform farming models to date.[10] Further inputs from the DAFF (now DALRRD), the DWS and feedback from existing irrigation projects were used to develop the farming models. The proposed farming models were used to develop the best approach options, further informed by the financial viability investigation, the proposed development areas, and the value chain requirements of the proposed expansion. The implications of these models and the case studies informed the proposed scenarios for allocation of water.

[10] Advisory Panel on Land Reform and Agriculture, 2019.

The *Land Reform Panel Report* discusses the viability of various land reform farming models that should be considered. The analysis is done from the perspective of the landowner, namely public land, private land, commonage land or land owned by a community. The viability of farming models in respect of these land ownership structures were investigated. The specific models are unpacked further below.

6.2.1 Group Operations on Communal Land[11]

"Communal land" in this instance refers either to land owned by the Government and leased by a Communal Property Association (CPA) or Community Trust, or land owned by a CPA or Community Trust directly. A CPA could be defined as a juristic person with the power to acquire, hold and manage property on a basis as agreed to by the members of a community in terms of a written constitution.[12] A Community Trust is like a CPA, in that property is also held in a trust, but the trust does not conform to the CPA Act. For the purposes of our study, the term "CPA" would be used to refer to both a CPA and a community trust. The specific legal structure of the entity should be considered on an *ad hoc* basis and is therefore not relevant for the purposes of this study.

Communal property ownership does have a purpose within the context of this study, namely, to protect land ownership for HDI communities, but in practice there are several issues to be considered. While these are appropriate vehicles for black land ownership, difficulties emerge due to the lack of state support for these institutions as required by the Communal Property Associations Act, Act 28 of 1996.

According to the *Land Reform Panel Report*, business planning for these projects is lacking which leads to problems with managing labour, input, and investment. Further problematic factors include poor incentive to work hard and invest in group ventures, the intricacies of large farming operations, and the need for critical and timely decisions.

A review of land reform projects in the Northwest Province confirms the problems canvassed above.[13] Surveys were conducted amongst land reform projects in 2005 and again in 2010, and the data was compared. The success of projects was investigated based on the number of individual participants. Successful projects were deemed to be those that have a stable production, or those that show an increase in production. See a summary of the findings in **Table 6-1** below.

[11] Advisory Panel on Land Reform and Agriculture, 2019: 120
[12] Communal Property Associations Act, Act 28 of 1996
[13] Kirsten et al., 2014 as per Land Reform Panel Report

Table 6-1: Success of land reform projects based on group size

Number of participants	Success rate
Less than 5	78%
6-10	50%
11-20	44%
21-50	38%
More than 50	33%

According to the study, the main reason for unsuccessful projects is conflict within the group. This leads to the conclusion that the bigger the number of land reform beneficiaries in a project, the greater the chance of conflict which may hamper project success. This finding is important to note, not only for CPAs or community trusts, but also when the number of beneficiaries or shareholders for other farming models are considered.

Projects on communal land may act as a safety net for the poor and increase food security. Examples of successful subsistence farming communities on communal land exists in Mexico, Brazil, and Malawi. A problem with communal ownership however is that communal land could not be used as security for obtaining access to credit. This limits the financial viability of such projects and creates a reliance on grants or other forms of institutional support for farming success. It is doubtful whether projects of this kind will lead to increased household income and food security. According to the Land Reform Panel Report, low output from communal projects has an impact on total agricultural output and value adding, which negatively impacts economic growth.

6.2.2 Individual Smallholder Farmers on Land Owned by Government[14]

In terms of this model, the state would buy land under the Pro-Active Land Acquisition Strategy (PLAS) and then lease the land to individual smallholders under the conditions of the State Land Lease and Disposal Policy.

Land acquisition via PLAS has proven to be very inefficient as land could be bought at rates that far exceed a fair market value. Further difficulty with this model is that production finance could not be obtained easily. Formal financial institutions would generally require that security need to be provided in the form of a bond against immovable property. The timing of access to funds in terms of CASP or the Micro Agricultural Financial Institutes of South Africa (MAIFSA) is also an issue, namely that access to these funds may be delayed or are not secured at all.

[14] Advisory Panel on Land Reform and Agriculture, 2019: 121

The chance of success in a project like this is also low unless operational funds are made available immediately when a lease is awarded in terms of PLAS. According to the *Land Reform Panel Report*, all beneficiaries should receive written lease agreements within at least five years.

6.2.3 Individual Smallholders on Land Not Owned by Government[15]

This scenario may lead to increased employment, agricultural production, and growth, based on both local and international examples. It includes individual smallholders on privately owned land, which is rented or leased from a private landowner. In this instance, the rights to the land are provided on a contractual basis. Permitted that the constraints to production finance are dealt with, this may be a viable option. Mentorship agreements and contracts for secure off-take of produce would further assist such projects to become successful.

Alternatively, the smallholder farmer would be the individual operator as well as the landowner. This option would be ideal, given that access to finance could be secured since security could be provided. Although access to finance could increase vulnerability and risk, this risk could be mitigated by creating strong links throughout the agricultural value chain. This would include links with agribusinesses, input providers and financiers as well as solid off-take agreements.

6.2.4 Individual Commercial Operations on Land Not Owned by Government[16]

This is the landholding model for commercial agriculture. The land is either owned by private entities and operated by the same entity, or the land is owned by a private entity and leased to a separate operational company. Variations of this structure may be used for commercially viable black-owned businesses. Global experience indicates that this model is highly appropriate for commercial farms of all sizes. The reason is that work, management, and investment incentives are all aligned because of the private profit objective of the project. When the business is profitable, it is also able to provide financial assistance to farm workers in the form of housing, schools, medical assistance, transport, retirement savings, etc. Note that commercial producers for an export market must comply with various consumer protocols like the Sustainability Initiative of South Africa (SIZA) and Fairtrade, which also includes socio-economic compliance for the assistance mentioned above.

The amount of post-settlement support needed under this model depends on the size and beneficiaries of the commercial operation. Small farms settled with poor beneficiaries will need support with extension support from DALRRD, marketing, and start-up and investment grants, which they may supplement with credit.

[15] Advisory Panel on Land Reform and Agriculture, 2019: 121
[16] Advisory Panel on Land Reform and Agriculture, 2019: 122

6.2.5 Summary

See below a summary (**Table 6-2**) of the various models indicating the land ownership, best application, and viability of each.

Table 6-2: Merits and Viability of Different Land Reform Models

#	Model name	Land ownership	Best application	Viability
1	Group operations on communal land	HDI community	Protecting land ownership for HDI communities	Viable for communal grazing Large scale operations viable if secure long-term leases are in place
2	Individual smallholder farmers on land owned by Government	Government	Proactive Land Acquisition Strategy (PLAS) projects	Not viable - leaseholders rarely get ownership
3	Individual smallholder farmers on land not owned by Government	HDI farmers / non-HDI farmers	HDI farmers to lease land from non-HDI farmers	Highly viable for both small- and large-scale commercial farms
4	Individual commercial operations on land not owned by Government	HDI farmers / non-HDI farmers	Commercial operations	Highly viable for both small- and large-scale commercial farms

In the *Agricultural Production and Farm Development Report* (DWS, 2020) Various "**best approach options**" are recommended for the uptake of water and development of the study area. A summary of these options is provided below **Table 6-3** below.

Table 6-3: **Recommended development per preferred irrigation scheme**

Scheme	Hectares	Recommended type of development
Jan Dissels	462	GWS consisting of a combination of commercial farmers and smallholders on state land. Ideal for smallholder development, being located very close to Clanwilliam Town. Proposed 50% smallholder development.
Clanwilliam	341	Private land. Combination of JVs and smallholder farmers.
Zandrug	1 119	Private land. Combination of JVs and smallholder farmers.
Bulshoek	266	Private land. Combination of JVs and smallholder farmers.
Right Bank Canal: Zypherfontein 1 Zypherfontein 2 Melkboom Trawal	 710 614 301 510	Private land. Combination of JVs and smallholder farmers. Located in the Trawal area, one or more of these areas can potentially be considered for a GWS, in combination with the construction of a new Right Bank canal.
Klawer Phase 1 Klawer Phase 2	412 438	Private land. Combination of JVs and smallholder farmers. Private land. Combination of JVs and smallholder farmers, in combination with the construction of a new Klawer Canal.
Coastal 1	93	Private land. Combination of JVs and smallholder farmers.
Ebenhaeser	312	63 Ha of Smallholder development and 250 ha for restitution farms (with 12 000 m^3/a allocations).

Note: 'JVs' in the table above can potentially include the option of black commercial farmers purchasing private land.

6.3 Needs Analysis for Smallholder Farmers

In the *Agricultural Production and Farm Development Report* (DWS, 2020) an analysis was performed of most of the elements of the agricultural value chain, including input supply, technical production assistance, grants, loans, marketing assistance and satisfaction of export and consumer protocols to become competitive. See below an illustration of a typical agricultural value chain in **Figure 6-1**.

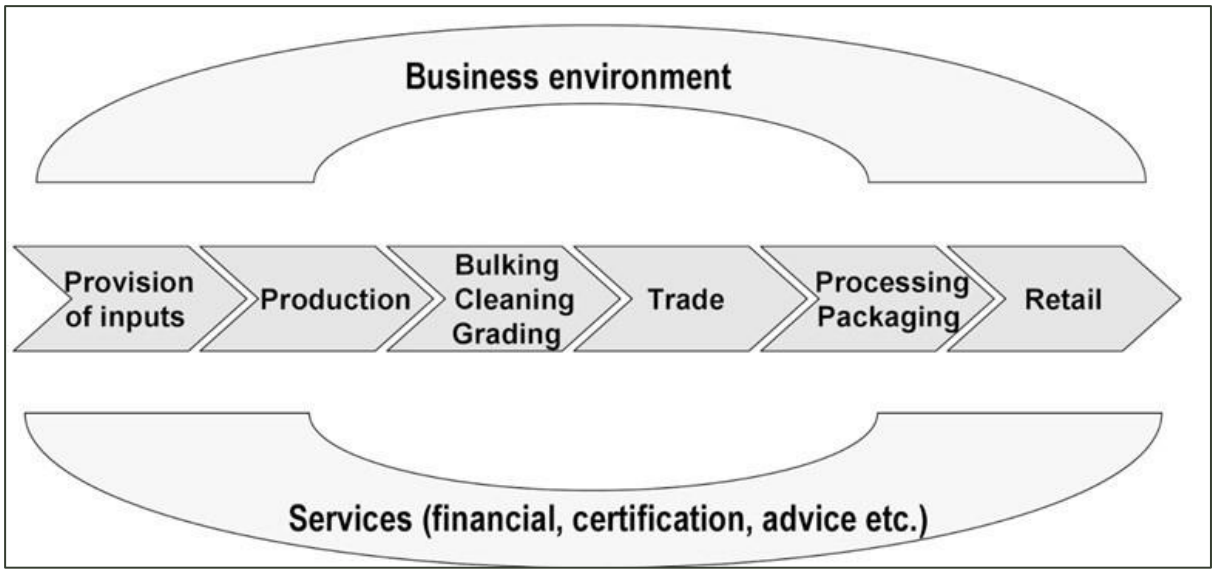

Figure 6-1: Typical Agricultural Value Chain

Each of the elements in the agricultural value chain needs to be met for smallholder farmers to be successful. It is important to understand these needs because successful support throughout the value chain is a prerequisite for projects to be financially successful, and ultimately for the various stated economic, socio-economic, and other policy benefits to realise. See a brief explanation of the most important elements and related Government support initiatives below.

6.3.1 Provision of Inputs

Most agricultural inputs could be viewed as consumables, which are needed to ensure crop growth per season. This includes pesticides, fertilizers, seed, tools and implements.

Inputs are mostly purchased from farming co-operatives or special dealers. For the purchasing of production inputs, it is important that smallholder farmer operations are located close to major towns in the study area. In the commercial agricultural sense, inputs must be purchased on a production loan or similar credit facility, which is to be paid back within a relatively short timeframe. This poses a problem for smallholder farmers, as they may not possess enough security to ensure that loans are available to them.

CASP of the DALRRD may provide grant support to smallholder farmers for the purchasing of certain agricultural inputs, including implements. This is regarded as indispensable for the success of smallholder farmers, as many of them are not able to procure loans to purchase inputs.

Industry bodies are also assisting with providing funds towards the aims of CASP, through the vehicle of the Commodity Project Allocation Committees (CPACs) and the Departmental Project Allocation Committees (DPACs). Various CPACs exist for the fruit industry, the citrus industry, the table grape industry, etc. It is understood that industry bodies contribute towards projects

identified via the CPACs, by means of allocating a portion of export levies for such a purpose. These funds could then be allocated to HDI projects via CASP. Note that other sources of funding (not only inputs) may also be available from industry bodies through the CPACs, DPACs and CASP.

6.3.2 Production including Land and Water

The production portion of the value chain constitutes most on-farm activities. Before production can even start, the development project would need enough agricultural land with enough water rights.

Regarding water access, the Resource-Poor Farmer Assistance (RPF Assistance) programme of the DWS may assist farmers to procure various forms of assistance related to water access. **Table 6-4** below indicates the various forms of assistance, together with a description of each.

Table 6-4: **Resource-Poor Farmer Assistance**

Resource-Poor Farmer Assistance Programmes[17]	
Name of Grant	**Description**
Capital Cost of Water Distribution Infrastructure	A contribution to the capital cost of off-farm bulk water distribution infrastructure.
O&M, WRM and Depreciation charges	A contribution to the Operation & Maintenance, Water Resource Management and Depreciation charges levied from the water user by the DWS
Acquisition of Water Allocations	Assistance with obtaining water use licence authorisations, specifically for water users that will form part of a GWS or WUA
Socio-economic Viability Studies of Schemes	Assistance with socio-economic viability studies for the development of irrigation schemes
Training of Management Committees	Assistance with training of resource-poor farmers to become part of management committees, e.g. WUAs
Rainwater Tanks for Household Productive Use by the Poor	Contribution to the capital cost of construction of storage tanks for rainwater harvesting and related works.

As could be seen in Error! Reference source not found., there are several options available to “resource-poor” Farmers as defined in the policy. Limited resources however currently remain within the DWS to follow up on this policy, and very limited grants were paid out since the inception of the policy.

[17] Department of Water Affairs and Forestry, 2004

6.3.3 Packing and Cold Storage

The value chain elements of bulking, cleaning, grading, processing, and packaging are grouped together as “packing and cold storage”. In the study area, there are mostly private facilities for packing and cold storage, and smallholder farmers would need access to these facilities if they were to become commercially competitive. For most subsistence farmers, packing and cold storage is non-existent, as the produce gets consumed on farm after harvest. For smallholder farmers, access to packing and cold storage is key, however there are limited facilities servicing smallholder farmers at acceptable rates. Proximity to market is also an important factor here.

The Department of Rural Development and Land Reform (DRDLR) has initiated an Agri-Parks project. An Agri-Park is defined as a networked innovation system of agri-production, processing, logistics, marketing, training, and extension services located in district municipalities. As a network it enables the growth of market-driven commodity value chains and contributes to the achievement of rural economic transformation. An Agri-Park is subdivided into Farmer Production Support Units with a primary production focus, Agri-Hubs and Rural Urban Market Centres.[18] An Agri-Park is planned for the West Coast District, but at present this Agri-Park is not in existence yet.

Should a functioning Agri-Park exist for the West Coast District, it may be able to assist smallholder farmers with packing and cold storage which would in turn allow them market access and increased profitability.

6.3.4 Trade and Marketing

Marketing and trading of produce is a key element in the agricultural value chain, as the sale of produce is the source of income for agricultural operations. Many commercial producers already have agreements for the secure off-take of their products, which decreases risk to a large degree. Smallholder farmers however do not necessarily enjoy a secure off-take, as they may not be able to produce the volumes required, at the quality required, to be commercially competitive. Commercial marketing institutions may also charge fees which the smallholder farmers may not be able to pay.

There is thus a big need for centralised marketing to the benefit of smallholder farmers.

6.3.5 Finance, Export Protocols and Advice

Smallholder farmers would need access to finance to become commercially profitable, including capital loans, production loans and revolving credit. The problem however is that they do not

[18] Department of Rural Development and Land Reform, 2016

possess enough assets to provide security for such credit. This hampers their ability to be competitive.

Export protocols also require stringent compliance to various safety, environmental and other standards, which may be impossible for smallholder farmers to adhere to on their own.

Lastly, smallholder farmers mostly need advice, either in the form of extension services from the WCDOA or other advice in the form of mentorship agreements with commercial producers.

6.4 Lessons From Other Projects

In this section, available case studies on land reform projects are discussed, to learn from them for the development of projects within the study area.

6.4.1 Land restitution projects

See below a discussion of three case studies on the successes and failures of land restitution projects.

Levubu Case Study[19]

The Levubu River is a tributary of the Limpopo River, and the Levubu Valley is situated East of the town of Makhado (formerly Louis Trichardt) in the Limpopo Province. Under apartheid, this area formed part of "white" South Africa, and land ownership was reserved for white people. The African population of the area was gradually removed from the best agricultural land, and their assistance mainly used as labour on the white-owned farms.

Virtually the entire irrigated area in the valley, more than 400 properties, has been reclaimed by local communities under the Restitution of Land Rights Act between 2004 and 2008. The communities constituted various tribal entities, which have been all formally established as CPAs or trusts. The farms in question are mainly planted with perennial fruit orchards, although sizeable areas were also used for annual crops such as cabbage, maize and sweet potatoes.

The various projects were managed in terms of strategic partnerships, and the push came from the Regional Land Claims Commissioner in Limpopo, working with the Restitution Support branch of the provincial Department of Agriculture. The communities also expressed the need for strategic partnerships, as they argued that they must not be saddled with elaborate enterprises that they are unable to manage effectively. The state agencies proposed that a single company, South African Farm Management (SAFM), controlled by the Boyes Group, would become the strategic partner for all the claimant properties in the Levubu Valley. SAFM was set up specifically to engage in such partnerships by established white interests in the agricultural sector and new

[19] Lahiff, Dacis and Manenzhe, 2012

black empowerment partners. The Regional Land Claims Commissioner subsequently selected a second company, Mavu Management Services (Mavu), formed by several white farmers in Levubu, with individual black partners, as a second strategic partner for the Levubu claimants. SAFM proceeded to manage 5 claimants, and Mavu the remaining 2 claimants. By 2007, however, a new strategic partner replaced the SAFM and Mavu, namely Umlimi Holdings.

From the outset, the farms were reportedly in poor condition due to neglect by previous owners, largely due to delays in release of purchase payments by the state and consequent delays in transfer of ownership to the communities. Initial harvests were below optimal, due largely to the lack of maintenance and necessary investment. While wages and agricultural inputs were available, no funds were available for new plantings or long-term investments. By late 2009, the farms were in serious financial trouble and by 2010, the management company was bought out by the community.

The ongoing difficulties experienced by the communities and the failure of financial benefits to materialise over a five-year period, contributed to growing tensions within the communities.

The restitution process at Levubu has restored large areas of land to its original owners. The high-value activities based on the land have, however, posed enormous challenges to the new owners, who lacked access to capital and technical expertise. Interventions by the state agencies responsible for restitution and post-settlement support, led to the consolidation of holdings into large, centralised units and the introduction of strategic partners. Without exception, the communities' experience of strategic partnerships was negative – productive capacity on the farms was run down, jobs were lost, state grants were expended with little benefit, and the communities were saddled with large debts. Both the strategic partners and the communities were vocal in their criticisms of the state agencies involved. The failures were due to the imposition of an elaborate and untested commercial model, excessive delays in the release of development grants and the lack of monitoring the performance of the projects (and even appreciating the need thereof).

Moletele Case Study[20]

The Moletele community is in the South-Eastern portion of the Limpopo province. The Moletele community enjoyed communal customary rights, which were reduced to beneficiary occupation rights under Apartheid. The Community launched a Land Claim in 2003, of which only 10% was transferred by 2012. Initial experiments with joint ventures involving former landowners gave rise to major difficulties, especially around access to working capital, with two out of three projects collapsing. Unlike Levubu, where development grants were exhausted and communities left with

[20] Lahiff, Dacis and Manenzhe, 2012

large debts, the problem at Moletele was that the bulk of the grants was never actually provided by the state although it was promised. This has, however, led to the negotiation of new community-private partnerships with better-resourced commercial partners.

Granting exclusive control of commercial operations to external partners makes such deals more attractive to commercial partners and the banks. From the perspective of the community leadership, participation in all aspects of commercial operations remains the ideal, but there is a growing awareness that the community is not well prepared for this role and that full joint ventures may not actually be workable under current conditions. While profitability and the need for investment are uppermost in the minds of community leaders and their business partners, the ordinary membership is undoubtedly more concerned with the delays in distributing any material benefits among the community.

In summary, the Moletele case study shows the importance of commercial involvement on the one hand and taking the needs of the community into account on the other. The community may not be able to understand the requirements of commercial viability, therefore communication with project beneficiaries becomes very important.

Amangcolosi Community Trust

The Amangcolosi community is situated in Kranskop in KwaZulu-Natal. In 2004, about 401 families were successful with a land claim through the Commission on Restitution of Land Rights. Over the years, this community was able to build a successful business, called Ithuba Agriculture, which employs at least 500 people from the area. The land is owned by the Amangcolosi Community Trust, and the business is owned by Ithuba Agriculture. The business was initially operated in a JV structure with a strategic partner, Crystal Holdings (Pty) Ltd. The strategic partnership with Crystal Holdings (Pty) Ltd has since ended, but Ithuba Agriculture is still a successful business in the sugar cane industry.[21]

Despite the challenges faced, Amangcolosi Community Trust and Ithemba Agriculture are regarded as a success due to the following factors:

a. Good, fertile land in a “land reform-friendly industry”,
b. Strong JV partnership, and
c. Strong and united leadership, including support from the traditional authority in the area.[22]

This case study of the Amangcolosi Community Trust is unique, as it shows that a land restitution project could be successful within a JV structure where HDI land ownership is protected.

[21] Tekie, 2016
[22] Tekie, 2016: 87

6.4.2 Joint Venture Projects

See below three examples of successful JV projects. Note that these examples are not based on detailed case studies, but rather on the consultant's understanding of the industries in question and available online information.

Bosman Adama (Pty) Ltd and Adama Wines (Pty) Ltd

Bosman Family Vineyards in Wellington empowered their workers and families through the Adama Appollo Workers Trust. The Adama Appollo Workers Trust holds a 26% ownership in Bosman Adama (Pty) Ltd, while Bosman Family Vineyards holds 74%. Bosman Adama (Pty) Ltd owns 500 ha of land, the Bosman Wines cellar and a vine nursery. Another project, Adama Wines (Pty) Ltd, is a black women owned wine label that is produced in the Bosman Wines cellar.

The Adama Wines project is a good example of a successful commercial JV project, especially given its vertical integration in the wine value chain. Not only do the HDIs draw benefit from on-farm activities, but also the cellar, nursery and marketing of a unique black-owned wine label. Black-owned wines are an emerging sector in the wine industry, one which should also be explored in the study area.

De Goree Farming (Pty) Ltd

The De Goree Farming project is a JV between the De Goree Employees' Trust and Van Loveren Vineyards (Pty)Ltd. The De Goree Employees' Trust holds 52% ownership, while Van Loveren Vineyards holds 48% ownership. The project started in 2006 and includes 116 HDIs that are also employed by Van Loveren Vineyards. De Goree Farming owns the land of 138 ha and the operating business. A long-term supply contract is in existence between De Goree Farming and Van Loveren Family Cellar. This means that all produce enjoys a secure off-take and allows for access to more segments of the wine value chain.

The project earned the national AgriBEE project of the year award for 2008, and the National Landcare Award for clearing of alien vegetation in 2009. The farm also obtained Fairtrade accreditation in 2009. It should be noted that this project is still in existence, some 14 years after its inception. The vineyards are likely in full production which allows for maximum dividends to the 116 beneficiaries.

Note that the De Goree Workers Trust was formed in 2006, when so-called "broad-based" empowerment trusts were supported by Government. Broad-based trusts typically include many beneficiaries. While this position is still supported by Unions, the current trend in JVs is to focus on smaller groups of beneficiaries, hence allowing for more benefit per individual.[23]

[23] As per discussions with Prof. Mohammad Karaan of the University of Stellenbosch

Zandberg Citrus Landgoed (Pty) Ltd

Zandberg Citrus Landgoed (Pty) Ltd is an empowerment project in the study area. The company is 50% owned by Suiderland Plase (Pty) Ltd, and 50% owned by the Zandberg Trust. The Zandberg Trust represents 49 beneficiaries that are permanent employees of Suiderland Plase. Zandberg Citrus Landgoed (Pty) Ltd bought a farm of 250 ha from Suiderland Plase, which purchase was funded in equal amounts by Suiderland Plase and the Zandberg Trust. The trust obtained a grant from the DRDLR for the transaction.

This project is a good example of a successful application of DRDLR funds to purchase both land and shares in a commercial business. During stakeholder engagements as part of this study, representatives of Zandberg Citrus Landgoed were present, and attested to the success of their project.

6.5 Recommendations

See below several recommendations based on the case studies. More detailed recommendations follow in the final chapter of this report.

Both the Moletele and the Levubu case studies represent unsuccessful projects. While they were not successful, they may provide insight because certain models worked or not. The Moletele case study acknowledges the need for commercial involvement to ensure competitiveness, while the Levubu case illustrates clearly how such models were largely untested at the time and led to various pitfalls. One of the more important aspects may be that the projects in this case study were undertaken on a large scale, with community-wide involvement. The later Land Reform Panel Report confirmed that smaller groups have a much bigger chance of success than the community-wide projects.

The Amangcolosi case study is helpful, as it provides a good example of a land restitution project with a successful commercial agricultural focus. For this project, a JV structure was used to get the project off the ground, but it is understood that the commercial partner had left the partnership due to allegations of fraud. Despite this fact, the project is still successful.[24] Important success factors include suitability of the crop and location, strength of the JV partnership before its demise and strong leadership (including support by the tribal authority).

Bosman Adama (Pty) Ltd, De Goree Farming (Pty) Ltd and Zandberg Citrus Landgoed (Pty) Ltd are good examples of successful JV projects with a commercial focus. Their structures are similar, namely that a private company owns both the land and the production business, an HDI trust receives benefit, and the project is integrated into the whole of the agricultural value chain.

[24] IDC, 2016

Note that all three of the above examples were formed when so-called "broad-based" empowerment trusts were supported by Government. Broad-based trusts typically include many beneficiaries. While this position is still supported by Unions, the current trend in JVs is to focus on smaller groups of beneficiaries, hence allowing for more benefit per individual.[25]

Note that the BBBEE Commission needs to audit all BBBEE transactions with a value of more than R25m. The BBBEE Codes has strict rules for accepting a trust as a vehicle in a broad-based ownership scheme and to avoid circumvention of the Codes. This includes excisable voting rights and that economic interests and net value remain in the hands of black people because of direct or indirect participation in the measured entity (refer to Statement 100, Annexures (B)-(D) of the BBBEE Codes of Good Practice for more detail). According to the BBBEE Commission, of the 341 ownership transactions submitted to it for registration from 9 June 2017 to December 2018, 33% involved broad-based structures in the form of Trusts, Broad-Based Ownership Schemes and Employee Share Ownership Schemes. When assessed against the ownership rules, most schemes did not meet the requirements as set out in the Codes.

If strategic partnerships or Joint Ventures are to be undertaken, it is important that a suitable group size be chosen, that the strategic partner remains accountable to the project and that the HDIs in the project are involved in the management thereof and will enjoy a degree of upskilling, both in terms of technical expertise and in terms of management capabilities.

The author of the Amangcolosi case study mentions research from the Centre for Applied Social Research (UK) which identifies factors contributing the success and failure of land reform projects. Please refer to the list of factors in **Table 6-5** below, together with additional factors as were identified in the case studies.

Table 6-5: Factors contributing to land reform success and failure

Factors contributing to success	Factors contributing to failure
Skilled and experienced leadership and good communication	Attempts to manage business enterprises under communal management
Active participation of claimant structure in project steering committees	Project steering committees that close out participation of members
Availability and utilisation of settlement planning and discretionary grants	Inappropriately structured and supported legal entities

[25] As per discussions with late Prof. Mohammad Karaan of the University of Stellenbosch during 2019

Factors contributing to success	Factors contributing to failure
Sustained support from Government and NGOs	Unclear determination of individual rights and benefits
Strategic partnerships, special purpose vehicles, mentoring and appointment of managers	Lack of clarity about roles and responsibilities leading to conflict
Avoiding delays in hand-over of productive farms to new beneficiaries	Lack of management and financial skills to run commercial enterprises
Vertical integration in the value chain in question	Poor quality / inadequately monitored service provisions

7 Recommendations

This chapter lists the recommendations emanating from this report and the sub-reports that informed it.

7.1 Financial Viability of Irrigation Farming

1) The feasibility of water uses and financial viability of existing irrigation farming, expansion of existing farms, new farms in the area, new black-owned farms in the area, and smallholder farms is provided, for different study zones and suitable crop combinations.
2) The expansion of existing irrigation farms will in general be financially more viable than the development of new irrigation farms.
3) For expansion of existing farms, citrus and table grapes appear to be profitable. The other crops that were investigated are only deemed profitable in certain circumstances.
4) It is anticipated that contributions to the capital cost of raising the Clanwilliam Dam and the bulk distribution infrastructure, through raised water tariffs may impact financial viability of farming operations.
5) Economic viable farm sizes for different crops are indicated.
6) Group operations on communal land can encounter many pitfalls and have a lesser chance of success. The main reason for unsuccessful projects is conflict within the group. The bigger the group, the lower the success rate is expected to be.
7) It was found that smaller agricultural units do not possess the economy of scale to compete commercially (especially if located on land owned by Government). A vegetable growing unit of 6 ha could provide a family with an income of approximately R96 000 per year.
8) The Jan Dissels Scheme and augmentation of supply to the Ebenhaeser community, to be implemented as GWSs, will provide significant opportunities for smallholders, although some smallholder farms can also be highly viably incorporated in the proposed development on privately-owned land.

7.2 Socio-economic Impact Assessment

1) A socio-economic impact analysis was separately undertaken for the construction and operational periods (in comparison with the baseline scenario), to evaluate the nature and magnitude of the socio-economic impacts emanating from the distribution and use of additional water from a raised Clanwilliam Dam, based on 2018 reconnaissance-level evaluation costs of new irrigation schemes.
2) Partial general equilibrium analysis was used to quantify the socio-economic impact of the development, with the South African national SAM providing the basis for this analysis.
3) Construction Phase results indicate that the development will have a very positive impact, and that the GDP will increase with R 290 million, capital formation with R1 277 million, employment opportunities with 861 and salaries and wages with R 230 million per annum over the construction period. The only negative is the balance of payments that will increase with R 96 million.
4) Operational Phase results for new irrigation areas indicate that the total GDP for the new irrigation areas is estimated to be R 2 674 million per annum (expressed in 2018 prices). In total an estimated 15 031 job opportunities can be created. The annual impact of the expected wages to be paid to the households is an estimated total of R 2 131 million annually, expressed in 2018 prices, of which 14% is to low-income households, at an average income of R 3 500 per month. Government income (taxes, etc.) will increase, on average, by R 766 million per annum.
5) Operational Phase Results for the existing irrigation areas, and producers with an improved assurance of supply, is estimated to be a total average GDP increase of R 601 million per annum, 4 611 additional jobs secured, i.e., people that will have a higher job security, and an average increase in household income of R 650 million per annum, fiscal impact of R 171 million and average annual stabilising impact of the increase in balance of payments of R 328 million.
6) The analysis undertaken indicates that the availability of the additional water from the raised Clanwilliam Dam, inclusive of the increased assurance of supply will have a substantial positive impact on the social and economic conditions prevailing in the area, and that there will be substantial poverty alleviation in the area.

7.3 Right Bank Canal Scheme Cost Analysis

1) From a capital cost point of view, the two development scenarios compared (Right Bank Canal vs. Left Bank Canal Alternative) are effectively the same, although the implementation of production areas would differ.

2) It is estimated that the total loss of income at farm level over two years, resulting from a break in the existing main canal could be in the region of R 1.2 billion for a 30-day water cut and R 1.5 billion for a 3-month water cut. At earnings before interest, tax, depreciations and amortisation, the losses are estimated at R 674 million and R 865 million, respectively.

3) It is estimated that the right bank canal will be constructed over a 4-year period, that the alternative two small supply schemes will be constructed over 3 years and that the betterment of the remainder of the left bank main canal will be implemented over a 15-year period thereafter.

4) The evaluation of social and economic conditions in the Cederberg and Matzikama Local Municipalities indicate that the future growth of the economy of the two municipalities will depend on increased irrigation.

5) The comparative evaluation of the two development scenarios indicates that the Right Bank Canal Scenario is preferable in terms of the baseline cost benefit analysis results, although both show viable results. The Right Bank Canal Scenario presents the stronger financial and economic results.

6) The detailed risk and sensitivity analysis performed show that both scenarios provided positive answers if no impact of the existing areas are taken into consideration, but the results of the Alternate Left Bank Scenario are considerably lower than the results from the Right Bank Canal Scenario. The second sensitivity comparison indicates that, if the financial results is lower than 15% of the expected results, then the Alternate Left Bank Canal Scenario is not viable.

7) The financial and economic viability analysis undertaken supports the recommendation that the Right Bank Canal is the preferred scenario, which is further supported by the significant benefits have been identified for the construction of the Right Bank Canal Scheme vs. the alternative.

8) It is concluded that the recommended decision to include a ‘Betterment’ cost component for the Right Bank Canal Scheme will have a positive impact socio-economic impact on the area.

7.4 Agricultural Production and Farm Development Analysis

1) The *Financial Viability of Irrigation Farming Sub-Report* (DWS, 2018) illustrated that the water use will make economic sense under certain circumstances, incl. economically viable farm sizes, high yields, and good market prices. The *Socio-Economic Impact Analysis Sub-Report* (DWS, 2019) concluded that the availability of additional water from the raised Clanwilliam Dam will have a substantial positive impact on the social and

economic conditions prevailing in the area, and that there will be substantial poverty alleviation.

2) Should the economic and socio-economic benefits of the scheme be realised, equity objectives need to be aligned with the objectives of commercial viability. For this purpose, the commercial JV model with a shared ownership has been found to be the most feasible option, given that it makes provision for black ownership, and could be commercially viable if the correct safeguards are in place.
3) Development of smaller agricultural units have not been found to be commercially viable, and communal land ownership also has many pitfalls. If models like these were to be successful, considerable inputs from Government, the commercial sector and the HDI communities would be required. The scale of such projects is also important – if the whole of the scheme is developed to smaller agricultural units, the socio-economic benefits of the scheme would not be met. if no such units are developed, it would undermine Government policy that allows for "'quick wins" through smaller agricultural units. It is therefore recommended that a balance be found between commercial JV projects and smaller agricultural units.
4) It should however be noted that further study may be needed into the feasibility of schemes for smaller agricultural plots, as the financial viability thereof could not be established within the ambit of this current study. Smaller agricultural units do not possess the economy of scale to compete commercially. Should a few smaller agricultural units be farmed together under a central mentoring agent, the issue of group size and weakened decision-making might surface. The case studies presented in this report also do not support such a centralised structure. At best, smaller agricultural units in Ebenhaeser should be provided with water for the restitution claimants to make a living on their land on a subsistence or smallholder basis. As was mentioned previously in this report, a smaller vegetable growing unit of 6 ha could provide a family with an income of approximately R96 000 p/a.
5) The JV model could be implemented within any of the irrigation design options. Given that a JV is a private initiative by the commercial sector, it would be up to individual applicants to make proposals for their ideal project structure during the Water Use Licence Authorisation Application (WULA) process.
6) Various "**best approach options**" are recommended for the uptake of water and development of the study area. Strategic partnership / mentorship agreements with the commercial sector should *inter-alia* be in place, to ensure that the whole value chain is serviced to ensure high yields, competitive prices and a secure off-take of crops. The way that the strategic partner or mentor derives benefit from the project should be scrutinised,

to ensure that no exorbitant fees are charged, and that project income reaches the communities. It may be possible for the Citrus and/or Table Grape industry to provide a commitment to such projects, where they in turn receive the fruit produced to be marketed. Although small farm sizes have not been found to be financially viable, a productive unit of 6 ha could provide a family with a basic income (e.g., the income of R 96 000 p/a for a small vegetable growing unit).

7) If **strategic partnerships or JVs** are to be undertaken it is important that the suitable group size be chosen. From experience, the size of the group has been found to be a significant factor of likely success of a project (the larger the group, the less chance of success in general). Further success factors for JVs require that the strategic partner remains accountable to the project and that the HDIs in the project are involved in the management thereof and enjoy a degree of upskilling, both in terms of technical expertise and in terms of management capabilities.
8) In addition to the above, support would be needed from DALRRD in terms of CASP, from Industry Bodies, from DWS in terms of Resource-Poor Farmer Assistance, and from DALRRD in terms of the One Household-One Hectare Project and the Agri-Parks project. It needs to be determined whether these programmes still hold the capacity to undertake an irrigation project at scale.
9) **Private development** refers to commercial development with a black-owned counterpart (51-100% black-owned). This was recommended as the most feasible development option in the *Feasibility Study for the Raising of Clanwilliam Dam*[26] and was confirmed. Private development was also identified as the most feasible option in terms of the *Land Reform Panel Report.*[27]
10) The recommendation per preferred irrigation development scheme is indicated in **Table 7-1** below.

[26] DWS, 2007
[27] Advisory Panel of Land Reform and Agriculture, 2019

Table 7-1: **Recommended development per preferred irrigation scheme**

Scheme	Hectares	Recommended type of development
Jan Dissels	462	GWS consisting of a combination of commercial farmers and smallholders on state land. Ideal for smallholder development, being located very close to Clanwilliam Town. Proposed 50% smallholder development.
Clanwilliam	341	Private land. Combination of JVs and smallholder farmers.
Zandrug	1 119	Private land. Combination of JVs and smallholder farmers.
Bulshoek	266	Private land. Combination of JVs and smallholder farmers.
Right Bank Canal: Zypherfontein 1 Zypherfontein 2 Melkboom Trawal	710 614 301 510	Private land. Combination of JVs and smallholder farmers. Located in the Trawal area, one or more these areas can potentially be considered for a GWS, in combination with the construction of a new Right Bank Canal.
Klawer Phase 1 Klawer Phase 2	412 438	Private land. Combination of JVs and smallholder farmers. Private land. Combination of JVs and smallholder farmers, in combination with the construction of a new Klawer Canal.
Coastal 1	93	Private land. Combination of JVs and smallholder farmers.
Ebenhaeser	312	63 Ha of Smallholder development and 250 ha for restitution farms (with 12 000 m^3/a allocations).

Note: 'JVs' in the table above can potentially include the option of black commercial farmers purchasing private land.

11) The Jan Dissels and Ebenhaeser schemes could ensure the development of about 5% of the total new development for smallholder farmers. Should the Trawal GWS be considered, this will provide a significant opportunity for the development of an additional 5% for smallholder farmers. The development of private land could alternatively be implemented with the premise that a few smaller agricultural units be farmed together under a central mentoring agent, i.e., the JV or black commercial farmer, to meet Government policy for "'quick wins" through smaller agricultural units.

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