Draft 1

Proposed Onseepkans Development

July 2014

Table of Contents

1. Abstract

This report explores the feasibility of investment into a new bulk water supply system in order to unlock the agricultural potential of Onseepkans through irrigated farming. Three components were investigated, which include the construction of the bulk water supply system, the re-establishment of crops on 118ha of lands in the flood plain and 32ha of existing irrigation developed by CSIR. This plan includes the new development of a further 200ha of irrigation for the establishment of high value table grapes outside the flood plain. The findings of this report can be tabulated as follows:

Location	**Area**	**Development cost**
Bulk Water Supply	500 ha	R 120 000 000
PDI	150 ha	R 28 860 000
Commercial	150 ha	R 0
New Development	200 ha	R 156 000 000
Total development cost		**R 304 860 000**

* Estimated costs depending on detailed terrain investigations and is based on current costs.

2. Introduction

Onseepkans is situated in the Namakwa district along the bank of the Orange River and lies 50km north of Pofadder (28° 44'S; 19° 17'E). Onseepkans is a small settlement with a border post with Namibia for traffic between Pofadder in South Africa and Keetmanshoop in Namibia. It was established in approximately 1916 by missionary settlers and relies today on the approximately 268 ha of irrigated lands which are supplied with irrigation water from the Orange River via a 16.4km long earth canal. In recent years, however the condition of the canal has deteriorated and large portions is overgrown with weeds and reeds. This impacts on the consistent supply of irrigation water and in peak season water availability becomes vulnerable which impacts negatively on production. The situation has reached such a stage where the canal has to be re-constructed in order to ensure security of irrigation water to producers.

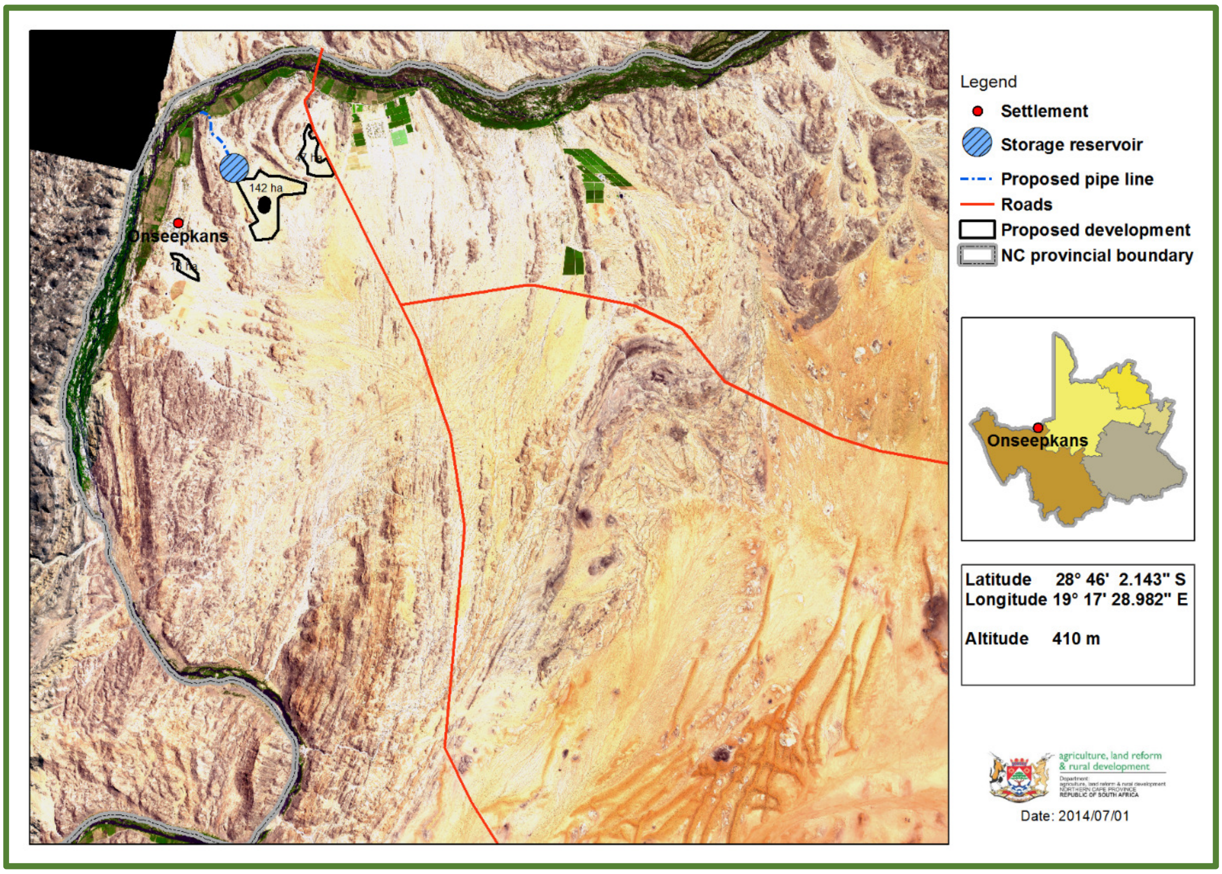

Figure 1. Onseepkans development

The primary objective of the proposed irrigation development project at Onseepkans, centers on economic growth, job creation and economic empowerment, through the revitalization of 268 ha plus 32ha of existing irrigation lands and the development 200 ha of irrigation land into an intensive export table grape production unit.

These objectives can only be realized once the bulk water supply to the irrigation lands are secured. For this to happen, the bulk water supply system needs to be re-constructed.

3. Expected outcomes

The project aims to harness solar energy to pump water in order to reduce on-farm operational cost. The expected benefits of irrigation development at Onseepkans will mainly revolve around economic empowerment of historically disadvantaged communities and the development and expansion of the local economies through:

- *Improved efficiency*

A significant increase in the efficiency of the bulk irrigation system will have a marked effect on water losses currently experienced. This will have a direct benefit through increased irrigation potential and decreased threat of water logging and salinization. The use of renewable energy will reduce operational costs markedly.

- *Land Reform and black economic empowerment*

The land under consideration is owned by the municipality and does not require to be procured in the open market. Income can be generated through agriculture which will significantly improve the economic situation of communities over time.

- *Infrastructure development*

Infrastructure requirements for the bulk water supply, renewable energy supply as well as production facilities, is significant and training opportunities will arise for beneficiaries in the delivery of related services. Local development and expansion of services will be encouraged.

- *Job creation*

Agricultural production will directly contribute to increased employment opportunities for community members and especially the youth. Small business opportunities will also be created in especially the services industry.

- *Food security*

The communities of Onseepkans are characterized by severe poverty and a large proportion of families rely heavily on social grants for subsistence. Income from agricultural development will contribute directly and indirectly to food security, i.e. the availability of enough and affordable food for all.

- *Training and capacity building*

The establishment of high value crops in Onseepkans will create a number of opportunities for schooled and unschooled individuals. Skills development though on-job and formal training will be a high priority in any development initiative.

4. Importance of agriculture in Namakwa District

According to the 2002 agricultural census (the last census data on District level) Namakwa contributed 7.3% to total Gross Farm Income of the Northern Cape. The importance of production under irrigation is relatively small if compared to the rest of the Province as the District produced 2.2% of the value of field crops and 2.4 % of the value of horticulture crops in the Northern Cape.

According to Global Insight calculations, Namakwa District was the only District that indicated a decrease in GDP per Capita for the period 1996 to 2012, dropping from R 36,692 to R 36,247 in constant 2005 prices. This means that output per capita decreased marginally over this period. The situation for Khai-Ma Municipality is even worse as the GDP per Capita decreased from R 29,187 to R24,020 for the same period. This highlights the need for additional development in these areas to reverse this trend.

The Gross Value that was added by the agricultural sector as a percentage of the total value that was added in the Northern Cape in 2012 totalled 6.34%. The contribution of the value added by agriculture in Namakwa District (R 768 million) accounted for 10.41% of the total value added by the District. The contribution of the value added by agriculture in Khai-Ma Municipality (R 69.9 million) accounted for 12.98% of the total value added by the Municipality. This indicates the relative important role agriculture plays in the District as contributor to value added to the economy and even more important role on Municipal level.

Remuneration to agricultural labour for the District was calculated at R 267 million and contributed 7.85% of total labour remuneration in the District, the 3rd highest contribution of all Districts. The average contribution of agriculture to total labour is 4.4% for the Northern Cape. Remuneration to agricultural labour for the Khai-Ma Municipality was calculated at R31.2 million and contributed 12.18% of total labour remuneration in the Municipal area. This also illustrates the importance of agricultural labour remuneration in the Municipal area and District compared to the rest of the Province.

Formal sector employment (number of persons employed) of the nine economic sectors, indicate a contribution from agriculture equal to 18% for the Northern Cape (2nd highest contributing sector). In Namakwa agriculture employed 23% of total formal sector employment (2nd highest contributing sector) and in Khai-Ma Municipal area 45% of total formal sector employment (highest contributing sector), clearly underlining the role of agriculture as job creator in rural areas. While there are moderate backward linkages with sectors such as manufacturing (e.g. fertilizers and chemicals), transport and services, minimum forward linkages exists with virtually no processing of agricultural products or agro-tourism ventures.

The potential for agro-tourism, agro-processing and value adding initiatives presents further opportunities for diversification of the local economy. It is recognized that successful promotion of agro-processing can impact positively on the incomes of primary producers, create employment and address market risks. It is also one of the means by which transformation of agriculture in the province can be achieved. Possible agro-processing ventures in the area include:

- Wine and juice production
- Dried fruit and vegetables
- Animal feed products
- Cereals

5. Demographic Profile of Namakwa District

Total Population………...124 940

As Percentage of South Africa……………………………………………………………….……0.25%

As Percentage of Northern Cape……………………………………………………………......11.65%

Population Density (people per km^2)…………………………………………………………………….0.9

South Africa…………………………………………………………………………………………….3.91

Northern Cape…………………………………………………………………………………………2.62

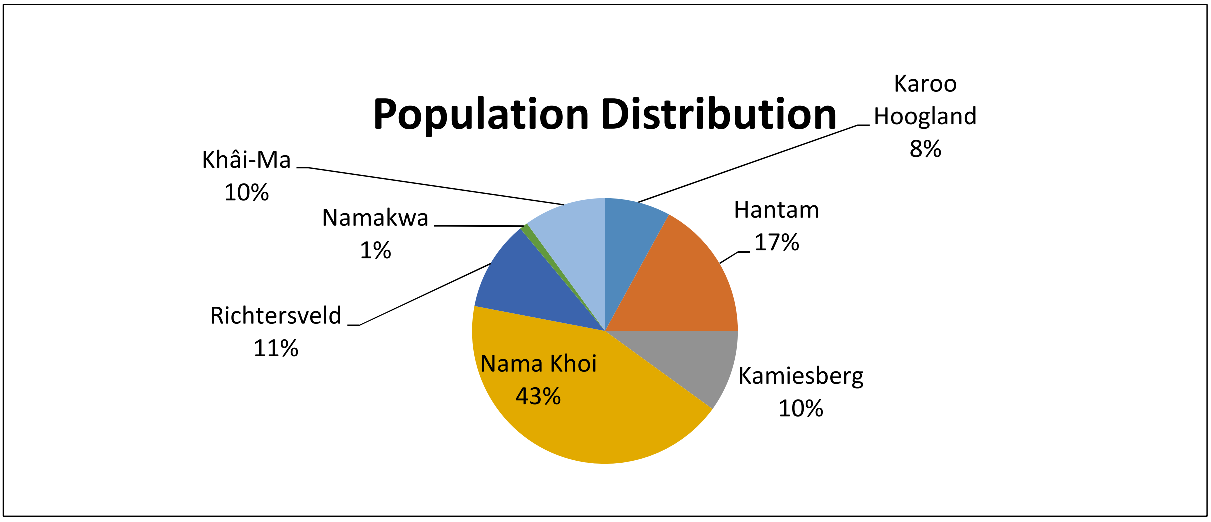

Figure 2. Population Distribution by Local Municipality

Source: Quantec Database, Community Survey 2007

*Namakwa refers to the Namakwa District Managed portions of the District.

6. Beneficiation

In 2005 & 2006 the Department of Land Affairs, through the LRAD Program, has purchased irrigation plots consisting out of 118.0765 ha irrigation land and has established 27 Close Corporation entities. Each Close Corporation consists out of 6 members or groups (162 LRAD beneficiaries). The beneficiaries and management structure for the 32 ha CSIR irrigation development and the proposed 200ha development must still be identified and will depend on the approved business model.

7. Stakeholders

Stakeholders in this project include:

- Department of Agriculture, Land Reform and Rural Development
- Department Rural Development and Land Reform
- Khai-Ma Local Municipality
- DWA
- Namakwa District Municipality (NDM)
- Co-operatives
- Onseepkans Water board
- Onseepkans Commercial & Small Scale Farmers
- ESKOM
- BVI
- Financial Institutions

- Agri-business

8. Management structure

During 2007 the Department of Agriculture, Land Reform and Rural Development has purchase two (2) tractors and lucerne implements for the 27 Closed Corporations. During 2008 the Onseepkans Agricultural Development Centrum Cooperative (OLOS) was established. The main aim of this Cooperative or Mechanization Service Centrum is to take ownership and management of the mechanization and to provide services to the LRAD beneficiaries.

For the proposed development the management structure has to be re-visited.

9. Project status

The current canal is in a poor condition and cannot deliver water to all the available irrigation lands and especially so in peak summer season. Over and above the general lack of maintenance over a long period, the canal has been damaged during the 2011 floods and large portions are overgrown with weeds. A number of plots covering approximately 83ha were submerged during these floods (Plots 11, 12, 13, 14, 17, 18, 20, 21, 22, 32, 42, 43, 44, 45, 48, 49, 50, 51, 52).

Tractors and implements have been procured for the mechanization center which acts as a co-operative and a store has been constructed. The tractors and implements needs to repaired and serviced.

10. Biophysical environment

The area lies in a semi-arid region and fresh water is a scarce resource in the district. It has implications for the types of agricultural activities that can take place, in that the most appropriate crops and the most water-efficient irrigation technologies need to be promoted. The only sustainable source of good quality irrigation water is the Orange River. In terms of biodiversity the area is rich in natural flora which can be harnessed as a unique tourism attraction. The area has a further competitive advantage with its hot and sunny climate with the highest solar radiation intensity in South Africa, making it appropriate for private and large-scale solar energy generation.

Climate

This Namakwa District of the Northern Cape Province is known for its semi-desert climate with extreme temperatures ranging from up to 45˚C in summer to - 2˚C in winter. The climate is variable due to its position in the transitional area between winter and summer rainfall. The winters are short and the area is well known for its high summer temperatures. Rainfall is erratic with average annual precipitation of 94mm which occurs mainly in the late summer in the form of thunder showers. Average days with frost per year are only 2 and crops can only be grown under irrigation.

Table 1 . Mean monthly climate data for Onseepkans

Elem	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	April	May	Jun
Maximum daily temp (° C)	23.05	25.02	29.59	32.01	35.2	37.31	38.9	38.15	36.17	31.18	26.42	22.16
Minimum daily temp (° C)	5.36	6.66	10.45	14.46	17.27	19.59	21.51	21.55	19.44	15.26	10.04	5.6
Average daily temp (° C)	13.53	15.49	19.58	23.52	26.59	28.76	30.47	29.89	27.68	22.67	17.64	13.31
Rainfall (mm)	1.26	0.52	0.01	7.78	4.22	9.65	12.59	23.6	15.18	12.2	9.37	6.62
Radiation (MJ/m^2)	14.72	18.37	23.57	27.18	30.87	32.32	30.95	27.31	24.06	19.31	15.22	13.52

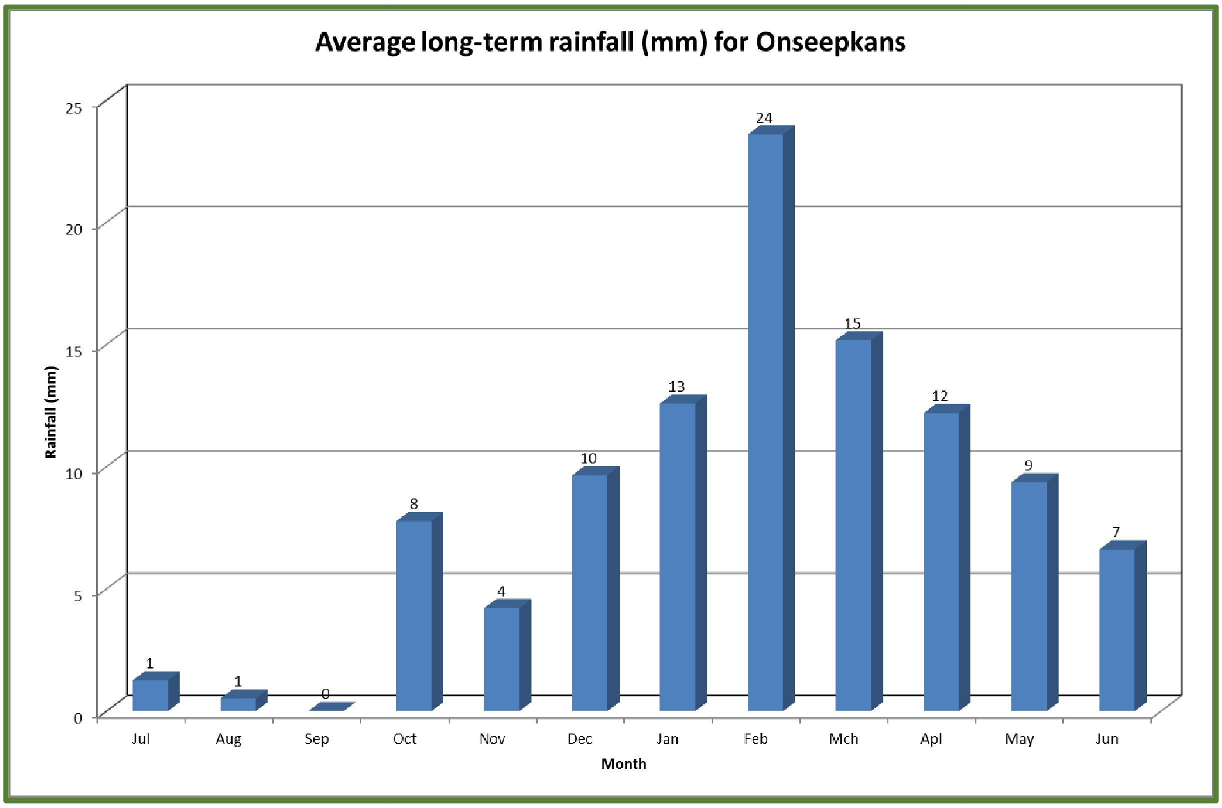

Figure 3. Average rainfall

Due to a lack of long term evaporation data for Onseepkans, mean data for Augrabies is tabulated below as this is the closest long term weather station in the area.

Table 2. Mean effective rainfall and evaporation

Augrabies (mm)												
Effective rainfall	Jan	Feb	Mch	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly	3	8	12	6	2	0	0	0	0	2	2	2
Evaporation (A-Pan)	Jan	Feb	Mch	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly	405	331	383	206	151	112	128	171	223	295	357	393
Daily	13	12	9	7	5	4	4	6	7	10	12	13

Geology and topography

Onseepkans lies in the Namaqua Metamorphic Complex and is composed mainly of pre-Gariep gneisses, granitoids and gabroids. This zone is so large and heterogeneous that it is difficult to generalize on its features apart from the medium to high metamorphic grade. It can however be subdivided into the following three sub-areas on the ground of its geologic evolution.

1) *Namaqualand* – Comprises of the Namaqualand highlands and coastal plain.
2) *Bushmanland* – Covers the area under investigation.
3) *Namibia* – Contains major inliers in the Luderitz and Karasburg districts.

Namaqualand is characterized by gneisses underlying the *Bushmanland* cover sequence in the western part. Underlying gneisses consist of pre-cover layered biotite gneisses and post cover augen granitoid gneisses which intruded into the mother material. The basement character of the layered gneisses is evident from the fact that they contain two structural elements (a folded schistosity) that have not been recognized in either the cover rocks or the augen gneisses that intrude them.

The existing irrigation lies on the flood plain of the Orange River and is characterized by recent alluvial deposits of the Orange River supporting soil forms such as Dundee and Oakleaf. The river cuts though a great variety of pre-Cambrian metamorphic rocks and the area is subject to floods caused by high precipitation in the Highveld during summer. The proposed site for the table grape development lies south of the alluvial plain on gently sloping pediment slopes. This area is characterized by gneissic rock and course grained metamorphic rocks from the Little Namaqualand Suite of the O'Kiep Group. This is interspersed by sedimentary material from the Korannaland Sequence which includes conglomerates, quartzite, schists and mica.

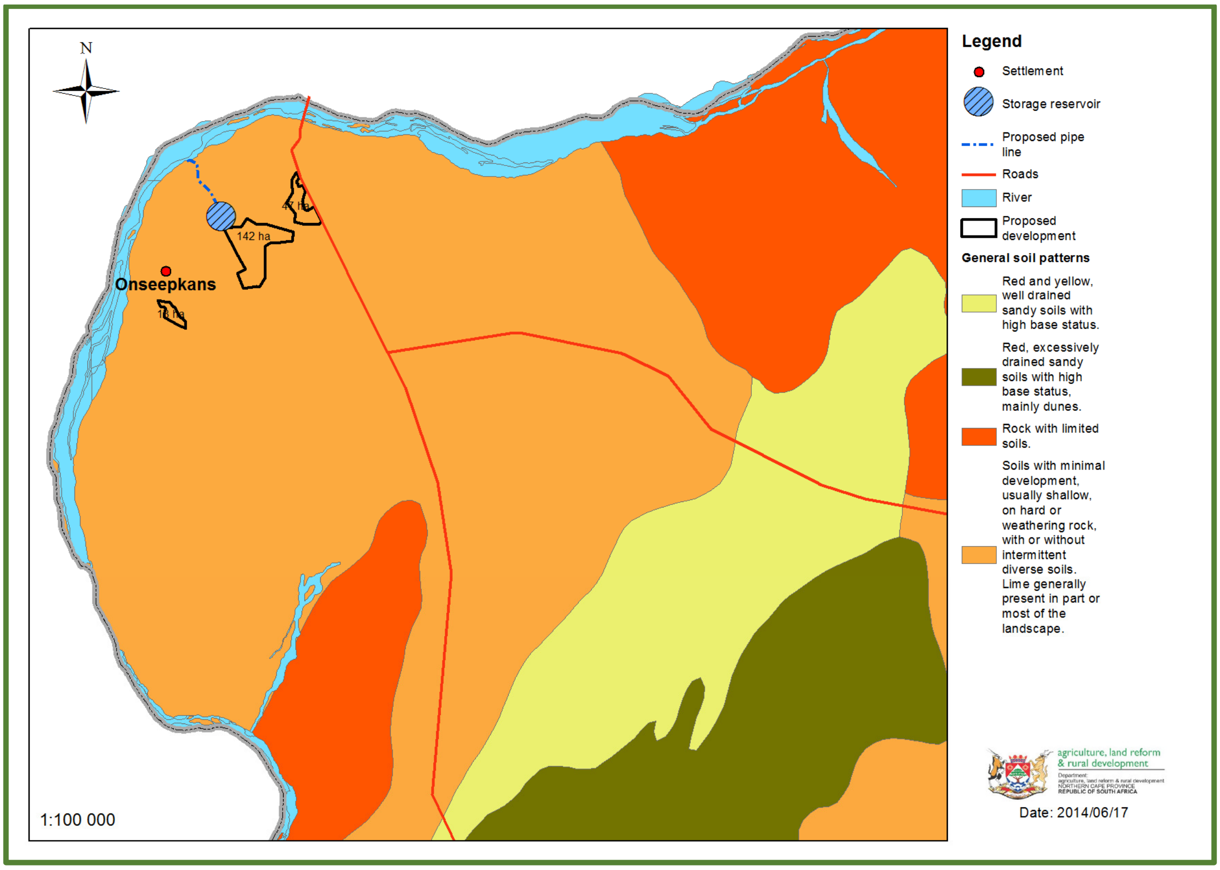

Figure 4. General soil patterns

The area within the Orange River flood plain with its alluvial character consists of fine sand and silt and has a fairly uneven micro-topography due to flood action causing erosion, but also depositing sedimentary material. In contrast the higher terrace appear to consist entirely of wind deposited material or it used to be alluvial material which was totally reworked by wind action. The result is a hummocky micro relief which ranges from fair to severe in other areas.

The last feature contains the alluvial fans which developed from drainage channels which emerge out of the mountains and which merge with the gently sloping pediment where the power of the streams become too low and where the sediment loads are dropped.

The topography of the area of interest around the Onseepkans settlement is generally gentle sloping. It is however bordered by mountainous terrain which might produce flash flooding during thunderstorms from tributaries and mountain streams that might develop.

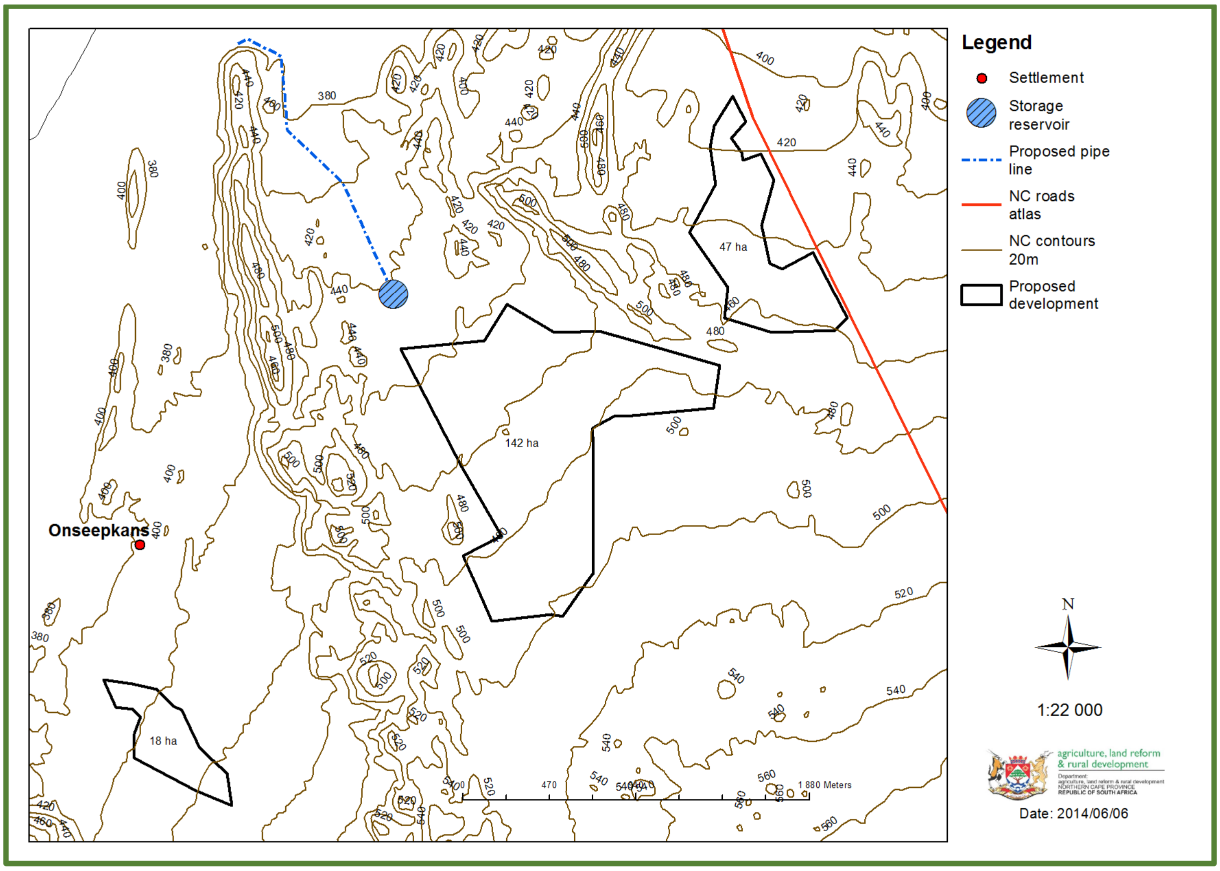

Figure 5. Topography

Vegetation

The long-term grazing capacity is very low for the Onseepkans farming area and ranges between 70 ha LSU-1 and 100 ha LSU-1 (Large Stock Unit) (Grazing map, 1993).

Both past and present farming activities on arid rangelands often placed immense pressure on the natural resources, often leading to the overutilization thereof (Esler, et al., 2010). On the communal managed rangelands there are often too many livestock, with only a few water points and not a proper grazing management system in place to allow rest for the rangelands. These non-equilibrium systems as are primarily controlled by various stochastic abiotic factors, such as droughts (Vetter, 2005), while Westoby et al. (1989) consider the high rainfall variability to be the primary driver for vegetation dynamics and claimed that grazing pressure from livestock only plays a marginal role in rangeland condition. Variable rainfall would, therefore, result in highly variable forage production and, accordingly, carrying capacity (Vetter, 2005). Less available forage results in higher mortality rates of livestock or more livestock being marketed.

The Onseepkans farm forms part of the Desert Biome of Southern Africa (Low & Rebelo, 1996; Rutherford et al., 2006). The term desert is roughly defined as an area with a mean annual precipitation of less than 75 mm and a sparse perennial vegetation canopy cover of less than 10%. The diversity of the vegetation in this biome is relatively high compared to the other deserts at the same aridity level globally. The Gariep vegetation types consist of some rocky areas which are dominated by sparse shrubs and leaf succulents. The vegetation within this Desert Biome can be quite sensitive to degradation, e.g. soil loss and changes in the plant species composition are some of the major impacts which resulted due to the mismanagement of livestock (Jürgens, 2006).

The focus area for the new development at Onseepkans is situated in the Eastern Gariep Plains Desert vegetation type and Eastern Gariep Rocky Desert (Figure 6).

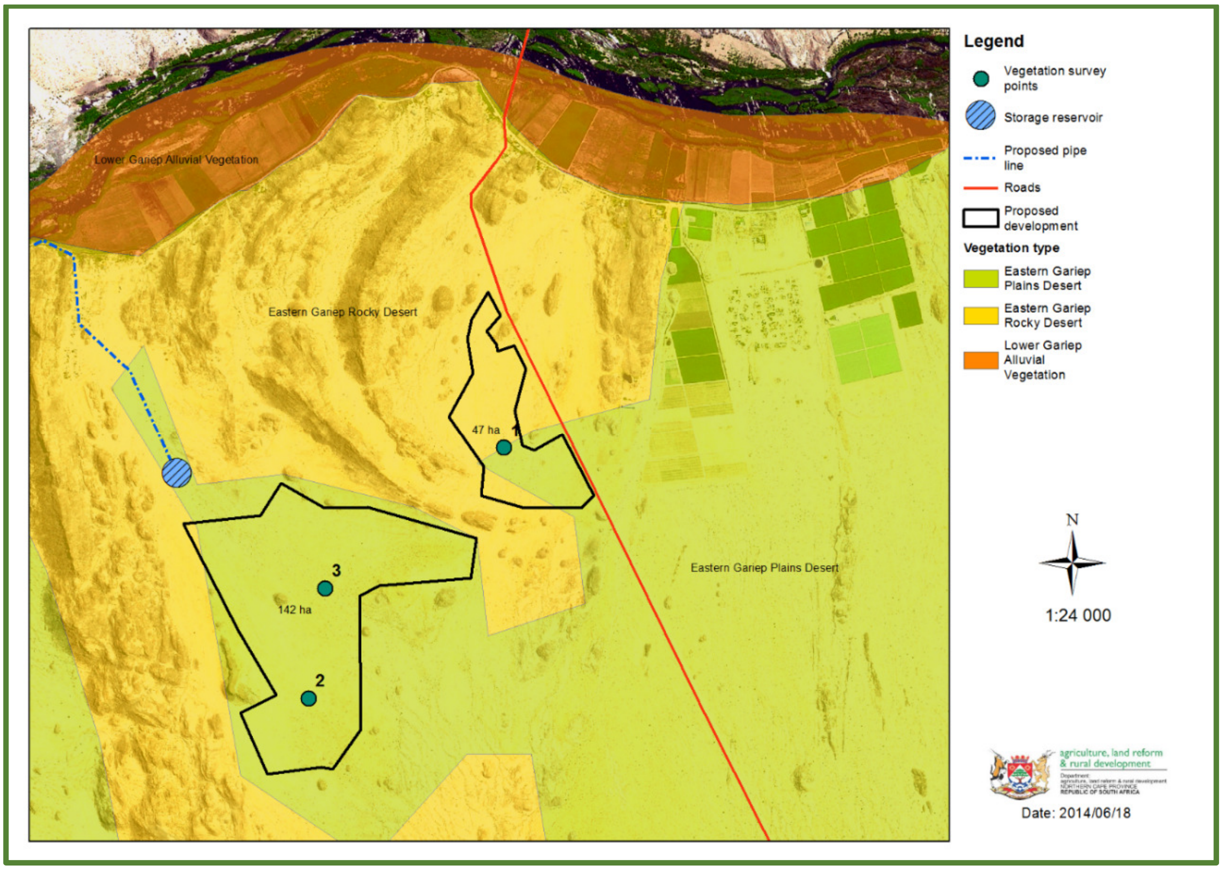

Figure 6. Vegetation types (Jürgens, 2006) of the Onseepkans farming area in the Northern Cape Province of South Africa within the Desert Biome.

The tree layer of this vegetation type is dominated by *Parkinsonia africana*, a small tree species (Jürgens, 2006). The succulent shrub layer consists of species such as *Brownanthus pseudoschlichtianus*, *Euphorbia gregaria*, Psilocaulon subnodosum and *Zygophyllum microcarpum*. Other shrub species include *Calicorema capitata*, *Gaillonia crocyllis*, *Hermbstaedtia glauca*, *Monechma spartioides*, Petalidium setosum and *Sisyndite spartea*. The grass layer is dominated by perennial grasses such as *Stipagrostis brevifolia*, *S. ciliata* and, *S. obtusa* (Jürgens, 2006). Also present within this vegetation type are the annual grass species *Schmidtia kalihariensis*. The perennial herb species include *Codon royenii* and *Rogeria longiflora* together with the succulent herb; *Mesembryanthemum guerichianum* (Jürgens, 2006).

Figure 7. Vegetation cover is dominated by the annual grass species Schmidtia kalihariensis with a very low density of perennial tufted grass plants.

Figure 8. Poor vegetative cover and heavy grazing is visible, with the more palatable grass tufts grazed down to the ground level. The smaller grass tufts in between is the more dominant less palatable Schmidtia kalihariensis which is not well utilized by the l

A poor vegetative cover is present with only eight species that provide a low ground cover protection and little palatable forage for livestock. The grass density is quite low, with a low basal cover of 2.5% and the dominant species being the annual grass plant (*Schmidtia kalihariensis*, Sour grass) and the perennial grass (Stipagrostis hochstetteriana). *Schmidtia kalihariensis* and *Stipagrostis hochstetteriana* is commonly found on disturbed gravelly soils. The two perennial, more palatable grasses (e.g. *Stipagrotis ciliata* and *S. obtusa*) which occur at a very low frequency (< 4%) are grazed to ground level (Figure 2). This continuous high grazing intensity on these more palatable grasses would inevitably result in the replacement thereof by less palatable pioneer species.

Palatable shrubs are heavily grazed; however, the shrub community is mostly dominated by the less palatable species; *Aptosimum spp., Euphorbia gregaria* and *Petalidium setosum* (Namib petal-bush). The invader species; Prosopis have been recorded in the survey area. The condition of the vegetation at this monitoring site reflects gross overstocking. The veld condition score of 665.5 for survey area 2 is relatively low and this can mostly be ascribed to the high occurrence of the annual grass species *Schmidtia kalihariensis*. The targeted areas of 142 ha and 47 ha are close by Viljoensdraai and Onseepkans with no fencing and therefore resulting in the movement of many animals through the area each day. Such an area is prone to the invasion by alien, invasive and encroacher species (e.g. the Prosopis spp. and *Acacia mellifera*). The two species mentioned have been observed in both the two grazing areas raising concern that the density of these two species will increase and the veld condition will only deteriorate further.

11. Agricultural potential

The evaluation of agricultural land potential and crop suitability can be approached in various ways. In the following paragraphs, three approaches will be discussed in relation to the proposed irrigation development at Onseepkans.

The National Department of Agriculture published a report in which the criteria for high potential agricultural land in South Africa were defined (Schoeman, 2004).

The specific area under consideration for irrigation at Onseepkans, based mainly on climate as well as soil suitability, can be rated low, medium to high suitability especially for irrigated agriculture. Based on the agricultural land potential and soil suitability rating, the potential issues of the proposed new development on agriculture are the following:

(a) Due to the dominant soil properties, inter alia,(i) topsoil horizons (ii) clay content (iii) effective root depth (iv) dominant soil form and series, it can be concluded that the soils of all the map units on the proposed area for irrigation have low to high potential for irrigated agriculture according to the criteria of Schoeman(2004). The area cannot be considered as prime land, because prime land is defined as the best land available, primarily from national perspective. However, this area can be defined as unique agricultural land, due to specific combinations of location, climate or soil properties that make it highly suitable for a specific crop, more especially table grapes.

(b) The potential impact on irrigated perennial crop production is high. The main reason is the availability of sufficient volumes of high quality water for permanent irrigation. Based on previous surveys and more recent aerial photographs as well as observations made during the field investigations, the assumption is that the soils and climatic conditions in the area make it economically viable for the production of perennial crops such as table, dry and wine grapes as well as dates and citrus. This is at present the most preferred crop in the area.

(c) The impact on the production of annual summer and winter grain crops and pastures is probably small on a local scale. This assumption is based on the fact that on the property itself, as well as on the surrounding farms with similar soils and terrain, there is no evidence of large lands that have been planted to summer as well as winter annual crops and pastures in the near past.

(d) Fodder crops such as lucerne has proved to be very successful in this area and especially so as a cash crop which ensures a fairly stable income throughout the year. Lucerne produced in this area is highly suitable for milk producers as fodder and in current market conditions it is probably the most lucrative cash crop in the area.

* A detailed soil investigation and determination of extent of available arable land still needs to be completed.

12. Crop suitability

The region is well known for especially the production of table grapes which is mainly exported to destinations in Europe, North America and to a lesser degree Asia. Other crops that is well adjusted for production in this area includes, dry grapes, wine grapes, dates, citrus, figs, pomegranates, lucerne, cotton, cucurbits and other vegetables such as onions.

A number of crops suited to the climate and conditions at Onseepkans have once again been identified. These were rated according to the following considered factors:

i. Market – The availability, size and access to markets.
ii. Biological and physical environment – How well crop is adapted.
iii. Cost of production – Capital requirement as well as production cost.
iv. Skills requirement – Level of skills and management inputs required.
v. Infrastructure – Level of infrastructure requirement and mechanization.
vi. Time – The time it takes to be in production.
vii. Job creation – Level of jobs created and labour required (taking into consideration the sparse population of this area).

The following is a subjective tabulation of the crop suitability of Onseepkans. This is totally guided by the information of technical assistants with the drafting of this document. Lack of market knowledge around crops such as pomegranates obviously counted heavily against it. Accurate market statistics and adaptability records will create big variation in this proposed table:

Table 3. Crop suitability at Onseepkans

Product	Market	Bio/phys	Prod cost	Skills	Time	Jobs	Infrastr	%
Dry grapes	10	10	7	7	7	8	6	86
Wine grapes	10	10	8	8	7	7	7	84
Table grapes	10	10	5	5	7	10	5	77
Dates	9	10	6	6	5	8	6	71
Dried Tomato	6	8	6	6	9	8	6	70
Lucerne	7	10	3	5	10	3	7	68
Citrus	7	7	7	7	5	6	6	67
Figs	7	8	5	5	5	7	5	63
Cucurbits	6	7	4	5	8	7	6	61
Cotton	4	10	3	3	9	5	7	58
Vegetables	5	6	4	5	7	10	5	57
Veg Seed	5	5	2	2	3	5	2	57
Melon Seed	5	5	2	2	3	5	2	57
Pomegranates	4	7	6	6	6	4	4	53
Essential oils	5	5	4	3	5	4	4	43

Markets and biological/physical adaptability was weighted heavily because of its overall importance. Due to the relative high requirement for jobs in the Onseepkans region and the fairly low population, very little weight was allocated to jobs in the above matrix. Produce which allows for on-site value adding such as drying of grapes, tomatoes and figs scored relatively high and needs further investigation.

Preliminary views recommend that some of the higher lying need to be planted under saline tolerant crops such as lucerne and cotton. Although both these commodities are currently experiencing price pressure, long term trends show that these will probably be the safest crops to plant in order to rehabilitate the more saline areas.

13. Implementation strategy

The irrigation development at Onseepkans is comprised of three distinct areas, separated in terms of their location from the river as well as beneficiation. The areas include:

A) **LRAD Co-op's** - This area lies mainly adjacent to the river on the flood plain and covers approximately 118 ha. There are another 32 ha available which has been developed by CSIR for Rose Geranium production. All these lands are dependent upon the canal for irrigation.

B) **Commercial farmers** – A portion of this land covering approximately 150 ha lies next to the river on the flood plain and will benefit directly from the upgrading of the canal. A further 100ha lies outside the flood plain and is irrigated directly out of the river.

C) **New Development** – This area lies outside the flood plain and will be irrigated form the proposed bulk water supply system.

These three locations will be treated separately as each requires unique inputs with regard to capital and especially infrastructure.

14. Bulk water supply (500 ha)

Table 4. Project activity schedule for bulk water supply

Task Name	Duration	Start	Finish
ONSEEPKANS IRRIGATION DEVELOPMENT	**1155 days**	**May 21 '14**	**Oct 23 '18**
A. INFRASTRUCTURE DEVELOPMENT (BULK WATER SUPPLY)	**497 days**	**Jul 14 '14**	**Jun 7 '16**
A.1 PRE CONSTRUCTION PHASE	**242 days**	**Jul 14 '14**	**Jun 16 '15**
A.1.1 EIA	**190 days**	**Jul 14 '14**	**Apr 3 '15**
EIA process and Water User's Licence	180 days	Jul 14 '14	Mar 20 '15
EIA ROD	10 days	Mar 23 '15	Apr 3 '15
A.1.2 ESKOM GRID CONNECTION	**240 days**	**Jul 14 '14**	**Jun 12 '15**
Lodging of application	20 days	Jul 14 '14	Aug 8 '14
Invoicing and payment	40 days	Aug 11 '14	Oct 3 '14
Cost estimate letter and approval	180 days	Oct 6 '14	Jun 12 '15
A.1.3 DESIGN AND DOCUMENTATION	**130 days**	**Oct 1 '14**	**Mar 31 '15**
Survey and design	100 days	Oct 1 '14	Feb 17 '15
Documentation	30 days	Feb 18 '15	Mar 31 '15
A.1.4 FUNDING	**110 days**	**Jul 14 '14**	**Dec 12 '14**
Period to finalize funding	110 days	Jul 14 '14	Dec 12 '14
Funding secured	0 days	Dec 12 '14	Dec 12 '14

Task Name	Duration	Start	Finish
ONSEEPKANS IRRIGATION DEVELOPMENT	**1155 days**	**May 21 '14**	**Oct 23 '18**
A.1.5 TENDER	**55 days**	**Apr 1 '15**	**Jun 16 '15**
Tender advertised	10 days	Apr 1 '15	Apr 14 '15
Tender period	20 days	Apr 15 '15	May 12 '15
Tender closes	0 days	May 12 '15	May 12 '15
Tender evaluation	15 days	May 13 '15	Jun 2 '15
Tender awarded	10 days	Jun 3 '15	Jun 16 '15
A.2 CONSTRUCTION PHASE	**250 days**	**Jun 23 '15**	**Jun 7 '16**
Construction start	0 days	Jun 23 '15	Jun 23 '15
Construction period	250 days	Jun 24 '15	Jun 7 '16
Construction completed	0 days	Jun 7 '16	Jun 7 '16

Costing

The costing of the project was done on the basis of experience with similar projects as well as on a quotation basis. Exact costs will however only be known once tenders have been submitted for the major works such as soil preparation, irrigation infrastructure etc. The estimated cost of the project is summarized in the following table:

Table 5. Projected cost of construction of bulk water supply

Activity		Cost	Total Cost
Bulk water supply	Pump station	R13 000 000	
	Main pipeline	R47 000 000	
	Storage dam	R11 500 000	
	Solar park & ESKOM connection	R31 000 000	
	Road	R2 500 000	
	Flood diversion wall	R15 000 000	
			R 120 000 000

15. PDI development (150 ha)

An activity schedule for the development of 150ha at Onseepkans is summarized in Table 6. Of this 32ha have been furbished with overhead and drip irrigation infrastructure.

Table 6. Project activity schedule

Task Name	Duration	Start	Finish
B. DEVELOPMENT PLAN FOR 118ha (PDI)	**993 days**	**May 21 '14**	**Mar 9 '18**
B.1 DEVELOPMENT OF LAND USE PLAN	**11 days**	**May 21 '14**	**Jun 4 '14**
Identification of irrigation land	1 day	May 21 '14	May 21 '14
Mapping & classification of soils	1 day	May 28 '14	May 28 '14
Soil analysis	1 day	Jun 4 '14	Jun 4 '14
Climate & crop suitability study	1 day	Jun 4 '14	Jun 4 '14
Geology and topography	1 day	Jun 4 '14	Jun 4 '14
EIA (not required)	0 days	May 21 '14	May 21 '14
Plough certificate	1 day	Jun 4 '14	Jun 4 '14
Water rights	1 day	Jun 4 '14	Jun 4 '14
B.2 ECONOMIC STUDY	**109 days**	**May 21 '14**	**Oct 20 '14**
Compilation of desk top Costing model	30 days	Jun 3 '14	Jul 14 '14
Compilation of Economic Feasibility study	30 days	Jun 3 '14	Jul 14 '14
Stakeholder approval of development model	40 days	May 21 '14	Jul 15 '14
Funding secured	15 days	Jul 15 '14	Aug 4 '14
Compilation of marketing plan	60 days	Jul 15 '14	Oct 6 '14
Presentation of business case	10 days	Oct 7 '14	Oct 20 '14
B.3 BENEFICATION	**240 days**	**May 21 '14**	**Apr 21 '15**
Identification of beneficiaries	0 days	May 21 '14	May 21 '14
Development of business model	40 days	Jul 16 '14	Sep 9 '14
Formalization of business structure	20 days	Sep 10 '14	Oct 7 '14
Training of beneficiaries (ongoing)	240 days	May 21 '14	Apr 21 '15
B.4 LAND USE ACTIVITIES AND IRRIGATION INFRASTRUCTURE	**693 days**	**May 21 '14**	**Jan 13 '17**
Determination of crop suitability	1 day	May 21 '14	May 21 '14
Farm planning	30 days	Oct 8 '14	Nov 18 '14
De-bushing	40 days	Nov 19 '14	Jan 13 '15
Construction of flood retaining wall	160 days	Aug 5 '14	Mar 16 '15
Surface and sub-surface drainage	1 day	Aug 4 '14	Aug 4 '14
Levelling and Soil preparation	120 days	Jan 14 '15	Jun 30 '15

Task Name	Duration	Start	Finish
B. DEVELOPMENT PLAN FOR 118ha (PDI)	**993 days**	**May 21 '14**	**Mar 9 '18**
Upgrade of on land irrigation	60 days	Jul 1 '15	Sep 22 '15
Establishment of field crops	40 days	Jul 1 '15	Aug 25 '15
Establishment of 40 ha vineyards	120 days	Aug 1 '16	Jan 13 '17
Procurement of inputs (ongoing)	300 days	Jul 1 '15	Aug 23 '16
B.5 MECHANIZATION	**160 days**	**May 21 '14**	**Dec 30 '14**
Compiling of mechanization plan	30 days	Nov 19 '14	Dec 30 '14
Procurement of tractors	1 day	May 21 '14	May 21 '14
Procurement of implements	1 day	May 21 '14	May 21 '14
B.6 FARMING INFRASTRUCTURE	**864 days**	**Nov 18 '14**	**Mar 9 '18**
Stores and buildings	1 day	Nov 18 '14	Nov 18 '14
Expansion of facilities	80 days	Jan 16 '17	May 5 '17
Fencing	60 days	Jan 14 '15	Apr 7 '15
Drying facilities	60 days	Dec 18 '17	Mar 9 '18
B.7 MONITORING AND EVALUATION	**30 days**	**Jul 16 '14**	**Aug 26 '14**
Drafting of plan	30 days	Jul 16 '14	Aug 26 '14

Costing

Table 7. Projected cost of development

Activity		Cost	Total Cost
Irrigation supply	De-bushing	R 30 000	R 3 600 000
	On land distribution	R 20 000	R 2 400 000
Soil preparation	Rip & levelling of 118 ha	R 30 000	R 3 600 000
Establishment of crops	Plant material (40ha)	R 30 000	R 1 200 000
	Trellising system for 40 ha	R 100 000	R 4 000 000
	Establishment of field crops	R 2 000	R 160 000
	Production inputs	R 10 000	R 1 200 000
Mechanization	Tractors & implements		R 2 000 000
	Workshop		R 500 000
Infrastructure	Expansion of store		R 2 000 000
	Drying facilities		R 2 400 000
	Fences		R 6 000 000
	Electricity supply		R 1 000 000
TOTAL			**R 28 860 000**

16. New Development (±200 ha)

Table 8. Project activity schedule

Task Name	Duration	Start	Finish
C. DEVELOPMENT PLAN FOR 200ha TABLE GRAPES	**1155 days**	**May 21 '14**	**Oct 23 '18**
C.1 DEVELOPMENT OF LAND USE PLAN	**285 days**	**May 21 '14**	**Jun 23 '15**
Identification of new irrigation land	15 days	May 21 '14	Jun 10 '14
Stakeholder engagement to acquire additional land	60 days	Jun 11 '14	Sep 2 '14
Mapping & classification of soils	40 days	Jun 11 '14	Aug 5 '14
Soil analysis	20 days	Jun 11 '14	Jul 8 '14
Climate & crop suitability study	5 days	Aug 13 '14	Aug 19 '14
Geology and topography	15 days	Jun 18 '14	Jul 8 '14
EIA for new lands	190 days	Sep 3 '14	May 26 '15
Plough certificate	20 days	May 27 '15	Jun 23 '15
Water rights	100 days	Sep 3 '14	Jan 20 '15
C.2 ECONOMIC STUDY	**240 days**	**Jun 11 '14**	**May 12 '15**
Compilation of desk top costing model	20 days	Jun 11 '14	Jul 8 '14
Compilation of Economic Feasibility study	20 days	Jun 11 '14	Jul 8 '14
Stakeholder approval of development model	60 days	Jul 9 '14	Sep 30 '14
Business case for equity development	160 days	Oct 1 '14	May 12 '15
C.3 DEVELOPMENT OF BUSINESS MODEL	**250 days**	**Jul 9 '14**	**Jun 23 '15**
Identification of beneficiaries	50 days	Jul 9 '14	Sep 16 '14
Identification of developers	80 days	Sep 17 '14	Jan 6 '15
Identification of mentors	40 days	Sep 17 '14	Nov 11 '14
Evaluation of business proposals	40 days	Jan 7 '15	Mar 3 '15
Formalization of business structure	40 days	Mar 4 '15	Apr 28 '15
Funding secured	40 days	Apr 29 '15	Jun 23 '15
C.4 IRRIGATION INFRASTRUCTURE DEVELOPMENT	**540 days**	**Oct 1 '14**	**Oct 25 '16**
Upgrade of electricity supply	240 days	Jun 24 '15	May 24 '16
Design of bulk water redistribution	90 days	Oct 1 '14	Feb 3 '15
Design of land irrigation system	50 days	Oct 1 '14	Dec 9 '14
Surface drainage design	40 days	Oct 1 '14	Nov 25 '14
Sub-surface drainage design	40 days	Oct 1 '14	Nov 25 '14
Construction of Irrigation system	240 days	Nov 25 '15	Oct 25 '16
C.5 ESTABLISHMENT OF TABLE GRAPES (200HA)	**830 days**	**Jun 24 '15**	**Aug 28 '18**

Task Name	Duration	Start	Finish
C. DEVELOPMENT PLAN FOR 200ha TABLE GRAPES	**1155 days**	**May 21 '14**	**Oct 23 '18**
Soil preparation	80 days	Jun 24 '15	Oct 13 '15
Pegging of roads and vineyard blocks	30 days	Oct 14 '15	Nov 24 '15
Procurement of plant material	240 days	Oct 26 '16	Sep 26 '17
Trellising material	360 days	Oct 26 '16	Mar 13 '18
Establishment of vineyards	360 days	Jan 18 '17	Jun 5 '18
Procurement of production inputs (ongoing)	360 days	Apr 12 '17	Aug 28 '18
C.6 MECHANIZATION	**310 days**	**Oct 1 '14**	**Dec 8 '15**
Drafting of mechanization plan	40 days	Oct 1 '14	Nov 25 '14
Procurement of tractors	40 days	Oct 14 '15	Dec 8 '15
Procurement of implements	40 days	Oct 14 '15	Dec 8 '15
C.7 INFRASTRUCTURE	**870 days**	**Jun 24 '15**	**Oct 23 '18**
Stores and buildings	80 days	Jun 24 '15	Oct 13 '15
Accommodation	100 days	Oct 26 '16	Mar 14 '17
Cold storage	80 days	Jun 6 '18	Sep 25 '18
Packing facility	100 days	Jun 6 '18	Oct 23 '18
C.8 MONITORING AND EVALUATION	**60 days**	**Jun 24 '15**	**Sep 15 '15**
Compilation of plan	60 days	Jun 24 '15	Sep 15 '15

Costing

Table 9. Estimated cost of irrigation development

Activity		Cost / ha	Total Cost
Bulk water distribution (200ha)	Pump station		R 4 000 000
	Main pipeline		R 7 000 000
	Storage dam		R 2 000 000
Surface drainage	Run-off control		R 4 000 000
Soil preparation	Rip of 200 ha	R 30 000	R 6 000 000
On land irrigation system	200 ha drip/micro irrigation system	R 35 000	R 7 000 000
Trellis system	200 ha	R 100 000	R 20 000 000
Production inputs	Plant material	R 40 000	R 8 000 000

Activity		Cost / ha	Total Cost
	Fertilizers and chemicals	R 5 000	R 1 000 000
Mechanization	Tractors	R 30 000	R 6 000 000
	Implements and equipment	R 20 000	R 4 000 000
Infrastructure	Building and storage		R 4 000 000
	Accommodation		R 18 000 000
	Packaging and cold storage		R 30 000 000
	Fencing		R 5 000 000
	Electricity supply		R 30 000 000
TOTAL			**R 156 000 000**

17. Economic Viability

Assumptions

The economic viability will be tested against two production levels, one on the current and existing irrigation that is taking place at Onseepkans (including both commercial farmers and land reform farms) and a second level of production where additional production of table grapes on current grazing land will be introduced as well.

The rationale is to test the viability of the relative expensive cost of providing bulk water through a canal/pipe system for the existing irrigation versus an option where additional irrigation land can be introduced that will also benefit from the bulk water infrastructure.

Current and Existing Production on 300 ha (Existing 150 ha commercial farming plus 150 ha land reform farms and projects)

Development will take place in three broad categories: One category includes the canal/pipe system that will provide the bulk water to individual plots/farms and the flood diversion walls to protect irrigation land from certain category of floods. This will benefit all farms (commercial and land reform) and the cost will be paid by government mainly. The second category includes the on-land and related development of the land reform beneficiaries and most of the initial cost will be paid by government. The third category is the additional on-land and related development (land that is currently fallow due to insufficient irrigation water available) on the commercial plots/farms which will be for the cost of the commercial farms.

To evaluate the viability of such an investment over a period of time, the total Onseepkans irrigation scheme is treated as one entity and income streams is tested against expenditure streams irrelevant of who is benefitting or responsible thereof. In the model Year 1 refers to the first year after completion of bulk water provision (canal/pipe system) and from this point onwards all agricultural related development can take place.

The development of the 150 ha of commercial irrigation land is budgeted to be developed over a 2-year period. It is estimated that 80 ha is under cash crop production and 35 ha with dried grapes. An additional 35 ha will be put under cash crop production during Years 2 to 3. The development of the 150 ha land reform land (118 ha from 27 existing entities and 32 ha from previous Sidosoas Project) will be developed with 110 ha under cash crops (Years 2 to 3) and 40 ha of dried grapes (Years 3 to 4).

Infrastructure development and mechanization is correlated to the irrigation development and expansion and is also distributed over a 4-year period, but the bulk of the development will be during the initial period ending at Year 1. In all instances an assumption was made that 100% of this infrastructure development will be funded through grant funding (bulk water supply and land reform farms) and own funding (commercial farms) and 0% from operational funds from farming to evaluate influence on cash flow. Farming operations from the entire scheme is responsible for paying production inputs.

Infrastructure development amounts to R151.140 million over a 4-year period and is broken down as follows:

Bulk water supply 300 ha (Table 6)	R120.000 million	Up to Yr 1
Mechanization 150 ha (Table 7)	R 2.500 million	Yr 3
Additional Infrastructure 150 ha (Table 7)	R 11.400 million	Yr 2-3
Development Cash Crops 145 ha	R 10.440 million	Yr 2-3
Development Dried Grapes 40 ha	R 6.800 million	Yr 3-4

The total development cost and grants funding required is summarized in Table 10 below.

Table 10.

Year	Development Cost	Grant/Own Funding Required
1	R120.000 mil	R120.000 mil
2	R 12.220 mil	R 12.220 mil
3	R 15.520 mil	R 15.520 mil
4	R 3.400 mil	R 3.400 mil
Total	**R151.140 mil**	**R151.140 mil**

Table 11, indicates the calculations and cash flow for the first eight years of budgeted operations. As already indicated, it is assumed that grant funding will be available to cover 100% of the development cost as specified above in the year of the cost.

Crop budgets was used for different crops to estimate income and expenditure streams and a gross margin was calculated for each crop that is used in the cash flow analysis. Apart from the direct costs that were calculated in the crop budgets, provision is also made for overhead costs to the farming costs and includes all relevant farming cost that does not change in accordance with changes in size of production. Provision was made at a cost of R5,000/ha for cash crops and R10,000/ha for dried grapes production and the weighted cost used for the entire irrigation scheme was R6,400/ha.

Depreciation is also introduced in the model and makes provision for the replacement and/or maintenance of infrastructure items that is required for running farming operations. As a lot of new infrastructure and equipment is introduced to the farming operations, the models calculates depreciation at a rate of 2.5% of total capital outlay from Year 11 to 15 and then at an increased rate of 5% from Year 16. The increase from Year 16 is due to higher maintenance cost on aging infrastructure and equipment and to cater for replacement of vineyards.

The cash flow effect is illustrated in Figure 9.

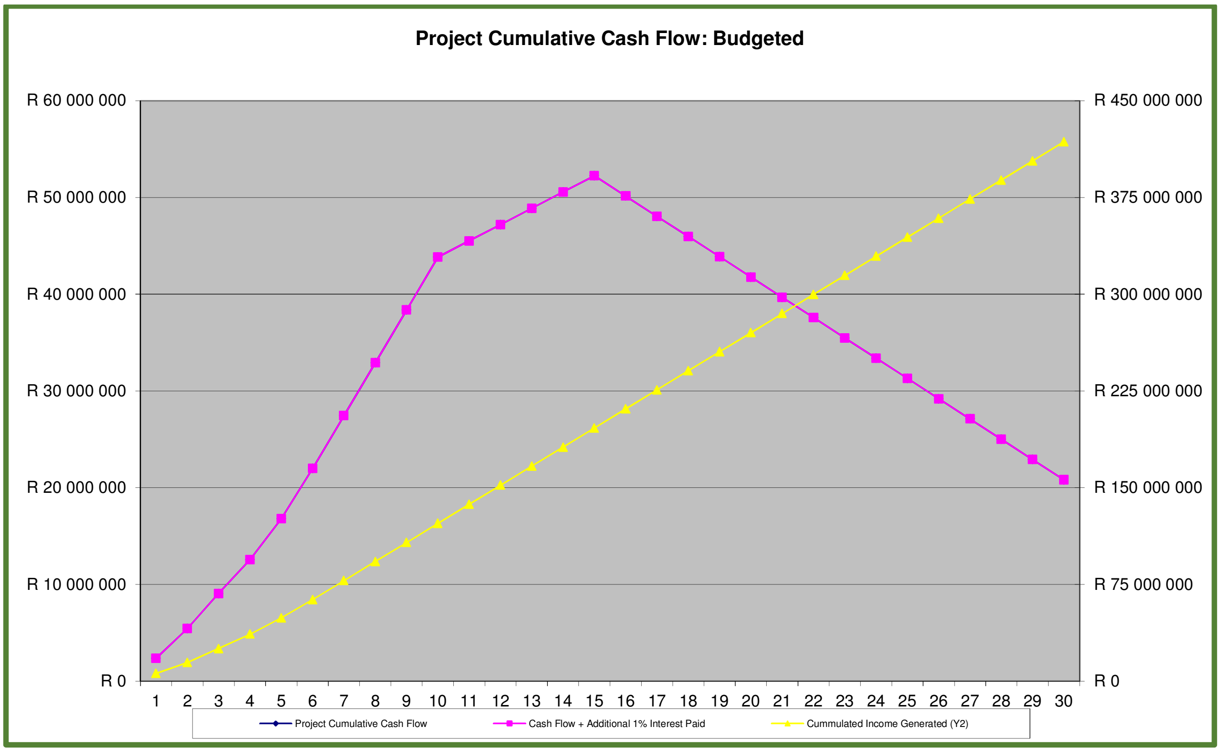

Figure 9. Project cumulative cash flow: budgeted

Table 11.

SCENARIO ACCORDING TO PROPOSED BUDGETS									
	Year	1	2	3	4	5	6	7	8
Total Infrastructure		R 120 000 000	R 12 220 000	R 15 520 000	R 3 400 000	R 0	R 0	R 0	R 0
Size Related Infrastructure Cash Crops	R 72 000	R 0	R 5 220 000	R 5 220 000	R 0	R 0	R 0	R 0	R 0
Size Related Infrastructure Dried Grapes	R 170 000								
Size Related Infrastructure Dates									
Size Related Infrastructure Table Grapes	R 205 000								
Grant		R 120 000 000	R 12 220 000	R 15 520 000	R 3 400 000				
Loan		R 0							
Interest Rate	12.50%								
Loan Repayment New Loan		R 0							
Loan Repayment Existing Loan		R 0							
Cash Crops (Total ha in Each Year)									
Lucern		64	122	180	180	180	180	180	180
Cotton		8	15	23	23	23	23	23	23
Groundnuts									
Maize									
Wheat/Barley		8	15	22	22	22	22	22	22
Cash Flow Cash Crops		**R 996 600**	**R 1 899 165**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**
Cash Flow Dried Grapes (Existing)	**35**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**
Cash Flow Dates (Existing)	**0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**
Cash Flow Table Grapes (Existing)	**0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**
Planting Schedule Dried Grapes									
1		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
2			R 0	R 0	R 0	R 0	R 0	R 0	R 0
3	20			-R 165 000	R 70 000	R 760 000	R 1 221 000	R 1 221 000	R 1 221 000
4	20				-R 165 000	R 70 000	R 760 000	R 1 221 000	R 1 221 000
5						R 0	R 0	R 0	R 0
6							R 0	R 0	R 0
7								R 0	R 0
8									R 0
9									
10									
Cash Flow Dried Grapes	**40**	**R 0**	**R 0**	**-R 165 000**	**-R 95 000**	**R 830 000**	**R 1 981 000**	**R 2 442 000**	**R 2 442 000**
Planting Schedule Dates									
1		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
2			R 0	R 0	R 0	R 0	R 0	R 0	R 0
3				R 0	R 0	R 0	R 0	R 0	R 0
4					R 0	R 0	R 0	R 0	R 0
5						R 0	R 0	R 0	R 0
6							R 0	R 0	R 0
7								R 0	R 0
8									R 0
9									
10									
Cash Flow Dates	**0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**
Planting Schedule Table Grapes									
1		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
2			R 0	R 0	R 0	R 0	R 0	R 0	R 0
3				R 0	R 0	R 0	R 0	R 0	R 0
4					R 0	R 0	R 0	R 0	R 0
5						R 0	R 0	R 0	R 0
6							R 0	R 0	R 0
7								R 0	R 0
8									R 0
9									
10									
Cash Flow Table Grapes	**0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**
Overhead Costs	**R 6 400**	**R 768 000**	**R 960 000**	**R 1 152 000**	**R 1 344 000**	**R 1 536 000**	**R 1 728 000**	**R 1 920 000**	**R 1 920 000**
Cash Flow per Annum		**R 2 365 350**	**R 3 075 915**	**R 3 622 255**	**R 3 500 255**	**R 4 233 255**	**R 5 192 255**	**R 5 461 255**	**R 5 461 255**
Cumulative Cash before Interest		R 2 365 350	R 5 441 265	R 9 063 520	R 12 563 775	R 16 797 030	R 21 989 285	R 27 450 540	R 32 911 795
Interest		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
Project Cumulative Cash Flow		**R 2 365 350**	**R 5 441 265**	**R 9 063 520**	**R 12 563 775**	**R 16 797 030**	**R 21 989 285**	**R 27 450 540**	**R 32 911 795**
Cumulative Cash before Interest		R 2 365 350	R 5 441 265	R 9 063 520	R 12 563 775	R 16 797 030	R 21 989 285	R 27 450 540	R 32 911 795
Interest (Plus Addditional 1%)		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
Cash Flow + Additional 1% Interest Paid		**R 2 365 350**	**R 5 441 265**	**R 9 063 520**	**R 12 563 775**	**R 16 797 030**	**R 21 989 285**	**R 27 450 540**	**R 32 911 795**
Project Income Generated		**R 6 090 800**	**R 8 429 150**	**R 10 788 700**	**R 11 163 700**	**R 12 538 700**	**R 14 163 700**	**R 14 788 700**	**R 14 788 700**
Cummulated Income Generated (Y2)		**R 6 090 800**	**R 14 519 950**	**R 25 308 650**	**R 36 472 350**	**R 49 011 050**	**R 63 174 750**	**R 77 963 450**	**R 92 752 150**
INFRASTRUCTURE BREAKDOWN:		**AMOUNT**							
Bulk Water Supply and Storage (300 ha)		R 120 000 000							
Mechanization (150 ha)				R 2 500 000					
Additional infrastructure (150 ha)			R 7 000 000	R 4 400 000					
Size Related Infrastructure Cash Crops		R 0	R 5 220 000	R 5 220 000	R 0	R 0	R 0	R 0	R 0
Size Related Infrastructure Dried Grapes		R 0	R 0	R 3 400 000	R 3 400 000	R 0	R 0	R 0	R 0
Size Related Infrastructure Dates		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
Size Related Infrastructure Table Grapes		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
TOTAL		**R 120 000 000**	**R 12 220 000**	**R 15 520 000**	**R 3 400 000**	**R 0**	**R 0**	**R 0**	**R 0**
TOTAL INFRASTRUCTURE	**100.0%**	**R 151 140 000**							
TOTAL GRANTS / CASH INVESTMENT	**100.0%**	**R 151 140 000**							
Cost of Production Inputs		**R 3 725 450**	**R 5 353 235**	**R 7 166 445**	**R 7 663 445**	**R 8 305 445**	**R 8 971 445**	**R 9 327 445**	**R 9 327 445**
Permanent Job Opportunities		**11**	**18**	**26**	**29**	**29**	**29**	**29**	**29**
Total Permanent Equivalent Jobs		**46**	**57**	**88**	**107**	**107**	**107**	**107**	**107**
Dividends Available Cumulative		**0**	**0**	**1 400 075**	**4 258 330**	**7 825 585**	**12 661 840**	**18 123 095**	**23 584 350**
Dividends Paid per Annum (Budgeted)		**0**	**0**	**1 400 075**	**2 858 255**	**3 567 255**	**4 836 255**	**5 461 255**	**5 461 255**

As it is assumed that 100% of the capital outlay will be funded by grants and/or own capital, the irrigation scheme is only responsible for production cost and the cash flow indicates an annual surplus from Year 1, also assisted by the fact that the majority of commercial irrigation land is already in production and does not need other capital investments to bring into production (see Figure xx1). As the additional 40 ha dried grapes, the cumulative cash flow increases its momentum from Years 4 to 7 and reaches an estimated R43.8 million by Year 10.

The decreases in the rate of the net cumulative cash flow for the periods Year 11-15, is the introduction of replacement cost for infrastructure that need to be covered by the farming operations. The annual increase in cash flow of about R5.5 million by Year 10, is decreased to only R1.7 million from Year 11 due to calculated depreciation cost of R3.8 million per annum needed for maintenance and replacements.

The rate of replacement is increased from Year 16 onwards to R7.5 million which exceeds the budgeted net income from the total farming operations and results in a net shortage/loss of R2.1 million per annum. This means that the capital outlay is too expensive for the farming operations to fund all future maintenance/replacements that will be needed to continue farming operations and will require outside funding to assist with payment of aging infrastructure.

To measure risk, two additional cash flow scenarios were added. The first is where the price of products is reduced by 10% from the price used in the budgeted scenario in Figure 10 and the second scenario is where the yield of crops have been reduced with 10% for the total period (Figure 11). As expected, the situations for both scenarios are much weaker and will require outside funding much quicker and at an increased rate.

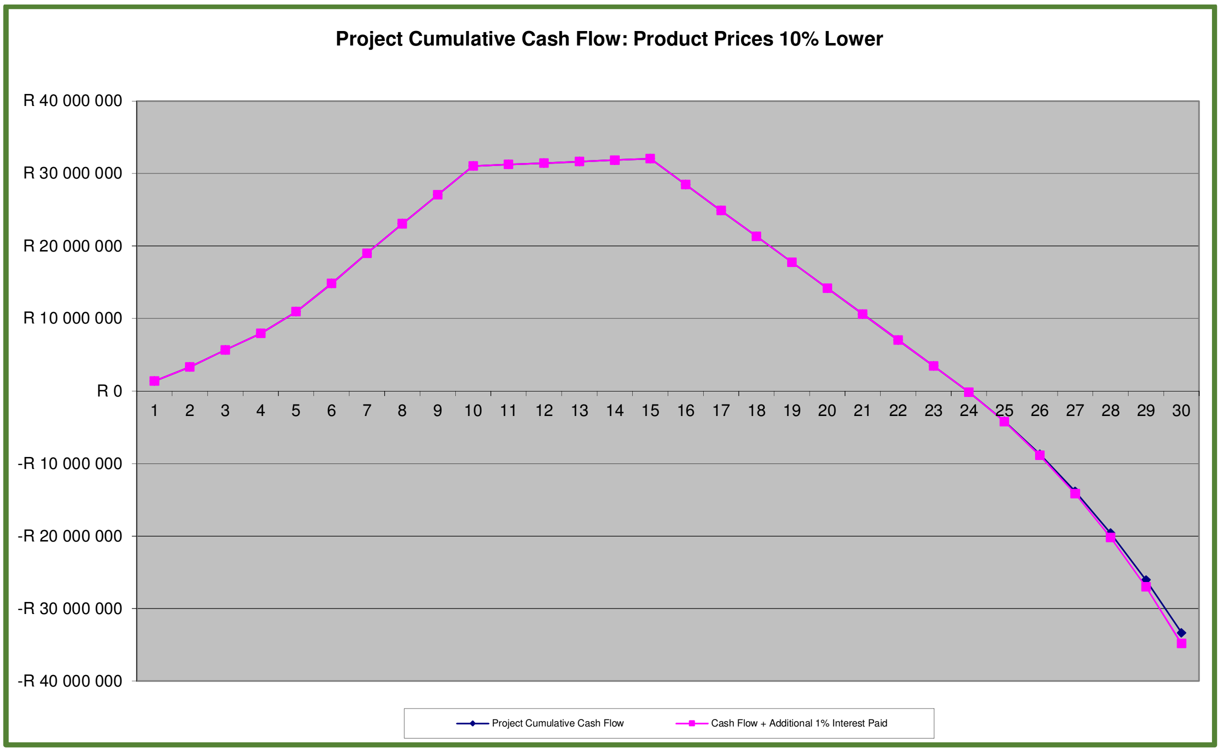

Figure 10. Project cumulative cash flow: product prices 10% lower

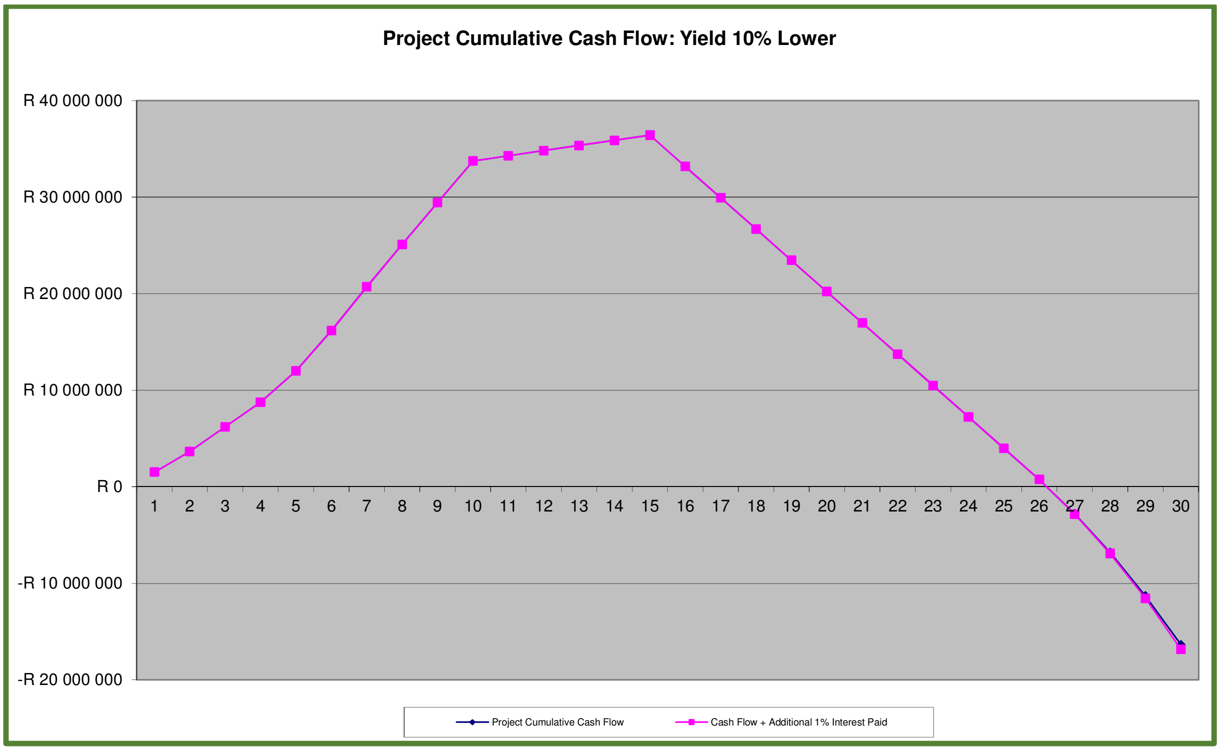

Figure 11. Project cumulative cash flow: yield 10% lower

Job creation remains an important factor and it is estimated that the entire scheme has the ability to create 29 full time jobs and that the total permanent equivalent jobs will be equal to 107 full time jobs.

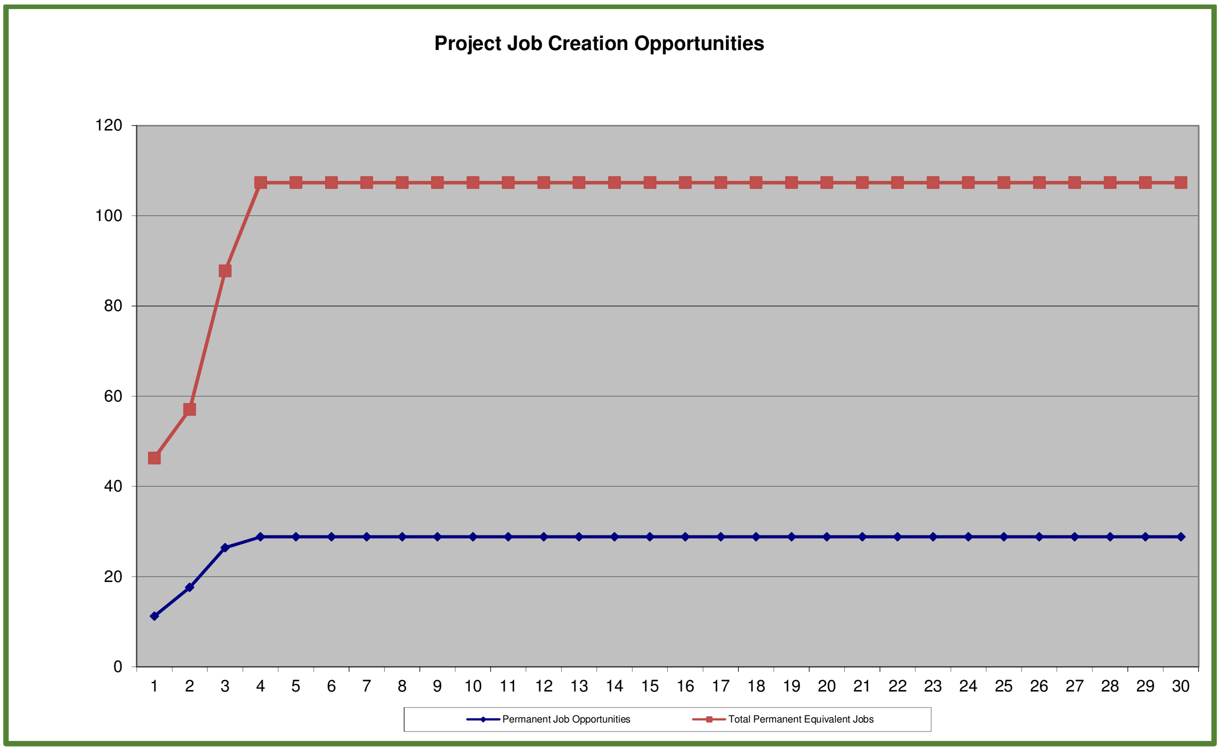

Figure 12. Job creation opportunities

As the future net income stream turns negative for the entire scheme, no further calculations in terms of return on investment could be made. Based on the future negative income stream, the entire irrigation scheme based on current irrigation land is not viable and expenditure on bulk infrastructure is not advisable.

Production on current land (Existing 300 ha irrigation land) and the Development of Additional 200 ha Table Grape Production

The rationale for this proposal came from the prospect that the bulk water provision can be done in a pipe system rather than a canal system and that additional irrigation water can be made available to be used on current grazing land where table grape production could be established. This idea will be tested to see if the additional production and income stream will be enough to turn the entire Onseepkans irrigation scheme viable. The rest of the scheme remains as described previously.

Infrastructure development and mechanization is correlated to the irrigation development and expansion and is also distributed over a 10-year period, with the bulk water supply development ending Year 1, the on-land development of the current and existing irrigation land Years 2-4 and the new table grape development Years 6-10.

It was again assumed that the bulk water supply will be 100% funded to the end of Year 1, mainly be means of government grants. For all further development an assumption was made that 85% of this infrastructure development will be funded through grant funding and/or own funding as needed and 15% from operational funds from farming activities of the irrigation scheme to evaluate influence on cash flow. Farming operations is also responsible for paying production inputs. As already described earlier with overhead cost, an estimated R15,000/ha was added for table grape production which brings the weighted overhead cost for the entire irrigation scheme to R9,750/ha.

Infrastructure development amounts to R306.140 million over a 10-year period and is broken down as follows:

Bulk water supply 500 ha (Table 6)	R120.000 million	Up to Yr 1
Mechanization 150 ha (Table 7)	R 2.500 million	Yr 3
Additional Infrastructure 150 ha (Table 7)	R 11.400 million	Yr 2-3
Bulk water supply and storage 200 ha (Table 11)	R 13.000 million	Yr 4
Additional Infrastructure 200 ha (Table 11)	R 43.000 million	Yr 4
Mechanization 200 ha (Table 11)	R 10.000 million	Yr 4-8
Accommodation 200 ha (Table 11)	R 18.000 million	Yr 5-10
Development Cash Crops 145 ha	R 10.440 million	Yr 2-3
Development Dried Grapes 40 ha	R 6.800 million	Yr 3-4
Development Table Grapes 200 ha	R 41.000 million	Yr 5-10

The total development cost and grant/own funding required is summarized in Table 12 below.

Table 12.

Year	Development Cost	Grant/Own Funding Required
1	R120.000 mil	R120.000 mil
2	R 12.220 mil	R 9.776 mil
3	R 15.520 mil	R 12.416 mil
4	R 61.400 mil	R 49.120 mil
5	R 9.100 mil	R 7.280 mil
6	R 9.100 mil	R 7.280 mil
7	R 38.200 mil	R 30.560 mil
8	R 18.200 mil	R 14.560 mil
9	R 11.200 mil	R 8.960 mil
10	R 11.200 mil	R 8.960 mil
Total	**R306.140 mil**	**R268.912 mil**

Table 13 indicates the calculations and cash flow for the first eight years of budgeted operations. As already indicated, it is assumed that grant and own funding will be available to cover almost 88% of the development cost as specified above in the year of the cost.

The same calculation method was used for the cash flow as described earlier. The Cash flow effect is illustrated in Figure 10.

Table 13.

SCENARIO ACCORDING TO PROPOSED BUDGETS									
	Year	1	2	3	4	5	6	7	8
Total Infrastructure		R 120 000 000	R 12 220 000	R 15 520 000	R 61 400 000	R 9 100 000	R 9 100 000	R 38 200 000	R 18 200 000
Size Related Infrastructure Cash Crops	R 72 000	R 0	R 5 220 000	R 5 220 000	R 0	R 0	R 0	R 0	R 0
Size Related Infrastructure Dried Grapes	R 170 000								
Size Related Infrastructure Dates									
Size Related Infrastructure Table Grapes	R 205 000								
Grant		R 120 000 000	R 9 776 000	R 12 416 000	R 49 120 000	R 7 280 000	R 7 280 000	R 30 560 000	R 14 560 000
Loan		R 0							
Interest Rate	12.50%								
Loan Repayment New Loan		R 0							
Loan Repayment Existing Loan		R 0							
Cash Crops (Total ha in Each Year)									
Lucern		64	122	180	180	180	180	180	180
Cotton		8	15	23	23	23	23	23	23
Groundnuts									
Maize									
Wheat/Barley		8	15	22	22	22	22	22	22
Cash Flow Cash Crops		**R 996 600**	**R 1 899 165**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**	**R 2 802 505**
Cash Flow Dried Grapes (Existing)	**35**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**	**R 2 136 750**
Cash Flow Dates (Existing)	**0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**
Cash Flow Table Grapes (Existing)	**0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**
Planting Schedule Dried Grapes									
1		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
2			R 0	R 0	R 0	R 0	R 0	R 0	R 0
3	20			-R 165 000	R 70 000	R 760 000	R 1 221 000	R 1 221 000	R 1 221 000
4	20				-R 165 000	R 70 000	R 760 000	R 1 221 000	R 1 221 000
5						R 0	R 0	R 0	R 0
6							R 0	R 0	R 0
7								R 0	R 0
8									R 0
9									
10									
Cash Flow Dried Grapes	**40**	**R 0**	**R 0**	**-R 165 000**	**-R 95 000**	**R 830 000**	**R 1 981 000**	**R 2 442 000**	**R 2 442 000**
Planting Schedule Dates									
1		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
2			R 0	R 0	R 0	R 0	R 0	R 0	R 0
3				R 0	R 0	R 0	R 0	R 0	R 0
4					R 0	R 0	R 0	R 0	R 0
5						R 0	R 0	R 0	R 0
6							R 0	R 0	R 0
7								R 0	R 0
8									R 0
9									
10									
Cash Flow Dates	**0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**	**R 0**
Planting Schedule Table Grapes									
1		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
2			R 0	R 0	R 0	R 0	R 0	R 0	R 0
3				R 0	R 0	R 0	R 0	R 0	R 0
4					R 0	R 0	R 0	R 0	R 0
5	20					-R 1 884 000	-R 1 000 000	R 1 080 000	R 2 610 000
6	20						-R 1 884 000	-R 1 000 000	R 1 080 000
7	40							-R 3 768 000	-R 2 000 000
8	40								-R 3 768 000
9	40								
10	40								
Cash Flow Table Grapes	**200**	**R 0**	**R 0**	**R 0**	**R 0**	**-R 1 884 000**	**-R 2 884 000**	**-R 3 688 000**	**-R 2 078 000**
Overhead Costs	**R 9 750**	**R 1 462 500**	**R 1 950 000**	**R 2 437 500**	**R 2 925 000**	**R 3 412 500**	**R 3 656 250**	**R 3 900 000**	**R 4 143 750**
Cash Flow per Annum		**R 1 670 850**	**-R 358 085**	**-R 767 245**	**-R 10 360 745**	**-R 1 347 245**	**-R 1 439 995**	**-R 7 846 745**	**-R 2 480 495**
Cumulative Cash before Interest		R 1 670 850	R 1 312 765	R 545 520	-R 9 815 225	-R 12 389 373	-R 15 378 040	-R 25 147 040	-R 30 770 915
Interest		R 0	R 0	R 0	-R 1 226 903	-R 1 548 672	-R 1 922 255	-R 3 143 380	-R 3 846 364
Project Cumulative Cash Flow		**R 1 670 850**	**R 1 312 765**	**R 545 520**	**-R 11 042 128**	**-R 13 938 045**	**-R 17 300 295**	**-R 28 290 420**	**-R 34 617 279**
Cumulative Cash before Interest		R 1 670 850	R 1 312 765	R 545 520	-R 9 815 225	-R 12 512 063	-R 15 672 467	-R 25 674 176	-R 31 684 871
Interest (Plus Addditional 1%)		R 0	R 0	R 0	-R 1 349 593	-R 1 720 409	-R 2 154 964	-R 3 530 199	-R 4 356 670
Cash Flow + Additional 1% Interest Paid		**R 1 670 850**	**R 1 312 765**	**R 545 520**	**-R 11 164 818**	**-R 14 232 472**	**-R 17 827 431**	**-R 29 204 376**	**-R 36 041 540**
Project Income Generated		**R 6 090 800**	**R 8 429 150**	**R 10 788 700**	**R 11 163 700**	**R 12 538 700**	**R 15 813 700**	**R 21 938 700**	**R 31 948 700**
Cummulated Income Generated (Y2)		**R 6 090 800**	**R 14 519 950**	**R 25 308 650**	**R 36 472 350**	**R 49 011 050**	**R 64 824 750**	**R 86 763 450**	**R 118 712 150**
INFRASTRUCTURE BREAKDOWN:		**AMOUNT**							
Bulk Water Supply and Storage (500 ha)		R 120 000 000							
Mechanization (150 ha)				R 2 500 000					
Additional infrastructure (150 ha)			R 7 000 000	R 4 400 000					
Bulk Water Supply and Storage (200 ha)					R 13 000 000				
Additional infrastructure (200 ha)					R 43 000 000			R 25 000 000	R 5 000 000
Mechanization (200 ha)					R 2 000 000	R 2 000 000	R 2 000 000	R 2 000 000	R 2 000 000
Accommodation (200 ha)						R 3 000 000	R 3 000 000	R 3 000 000	R 3 000 000
Size Related Infrastructure Cash Crops		R 0	R 5 220 000	R 5 220 000	R 0	R 0	R 0	R 0	R 0
Size Related Infrastructure Dried Grapes		R 0	R 0	R 3 400 000	R 3 400 000	R 0	R 0	R 0	R 0
Size Related Infrastructure Dates		R 0	R 0	R 0	R 0	R 0	R 0	R 0	R 0
Size Related Infrastructure Table Grapes		R 0	R 0	R 0	R 0	R 4 100 000	R 4 100 000	R 8 200 000	R 8 200 000
TOTAL		**R 120 000 000**	**R 12 220 000**	**R 15 520 000**	**R 61 400 000**	**R 9 100 000**	**R 9 100 000**	**R 38 200 000**	**R 18 200 000**
TOTAL INFRASTRUCTURE	**100.0%**	**R 306 140 000**							
TOTAL GRANTS / CASH INVESTMENT	**87.8%**	**R 268 912 000**							
Cost of Production Inputs		**R 4 419 950**	**R 6 343 235**	**R 8 451 945**	**R 9 244 445**	**R 12 065 945**	**R 15 433 695**	**R 22 145 445**	**R 30 789 195**
Permanent Job Opportunities		**11**	**18**	**26**	**29**	**39**	**49**	**69**	**89**
Total Permanent Equivalent Jobs		**46**	**57**	**88**	**107**	**167**	**227**	**347**	**467**
Dividends Available Cumulative		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Dividends Paid per Annum (Budgeted)		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

As it is assumed that 100% of the capital outlay up to Year 1 will mainly be funded by grants and that 85% of the remaining capital outlay will be funded by grants and/or own capital, the irrigation scheme is only responsible for production cost and the cash flow indicates an annual surplus for Year 1, also assisted by the fact that the majority of commercial irrigation land is already in production and does not need other capital investments to bring into production (see Figure 13). The scheme cash flow is also able to handle the 15% contribution of capital outlay in Years 2-3. As the last portion of 40 ha dried grapes and the new development of the table grapes start in Year 4, the cumulative cash flow for the entire scheme turns negative to reach a peak of –R36.3 million in Year 9. From then on the increased portion of table grapes coming into production turns the annual net income positive and the cumulative negative cash flow is gradually reduced and turns positive by Year 13.

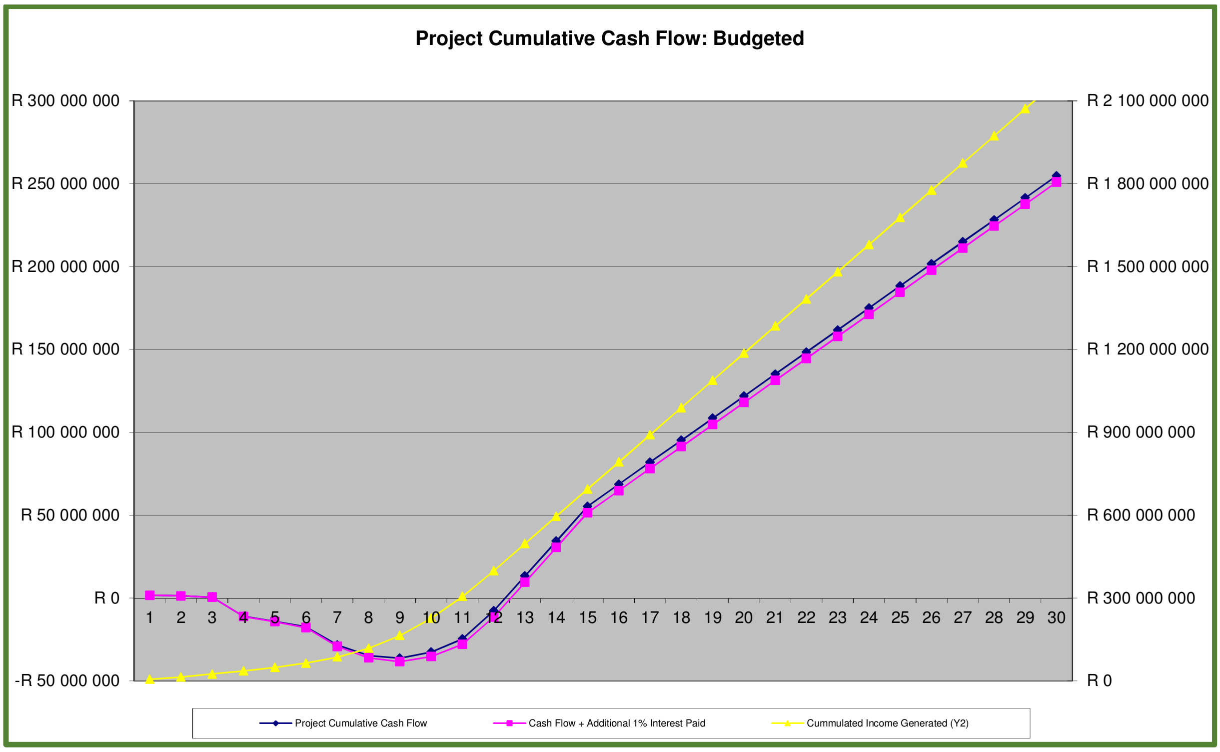

Figure 13. Project cumulative cash flow: budgeted

As already indicated the cumulative cash flow reaches a break-even point in Year 13 when it turns positive and it is estimated that the total net cash generated over the 30-year period for this scenario will amount to almost R255 million. The total income generated over this period (value of total production) amounts to more than R2.1 billion and indicates the value that this production will add to the economy of the region.

Year 11-15 sees the introduction of depreciation of R7.7 million per annum as maintenance and replacement cost for infrastructure that need to be covered by the farming operations. The rate of replacement is increased from Year 16 onwards to R15.3 million per annum, explaining the additional decrease in the rate of net cash flow increase. From Year 16 the entire irrigation scheme produces a net farm income of R13.3 million.

To measure risk, the two additional cash flow scenarios were added. In Figure 14 it is indicated that the maximum cumulative shortage by Year 10 amounts to –R84.1 million and the interest load is too high to recover from that. Under this reduced price situation the development pace should be slowed down and/or a higher grant/own funding contribution should be introduced, probably 95%.

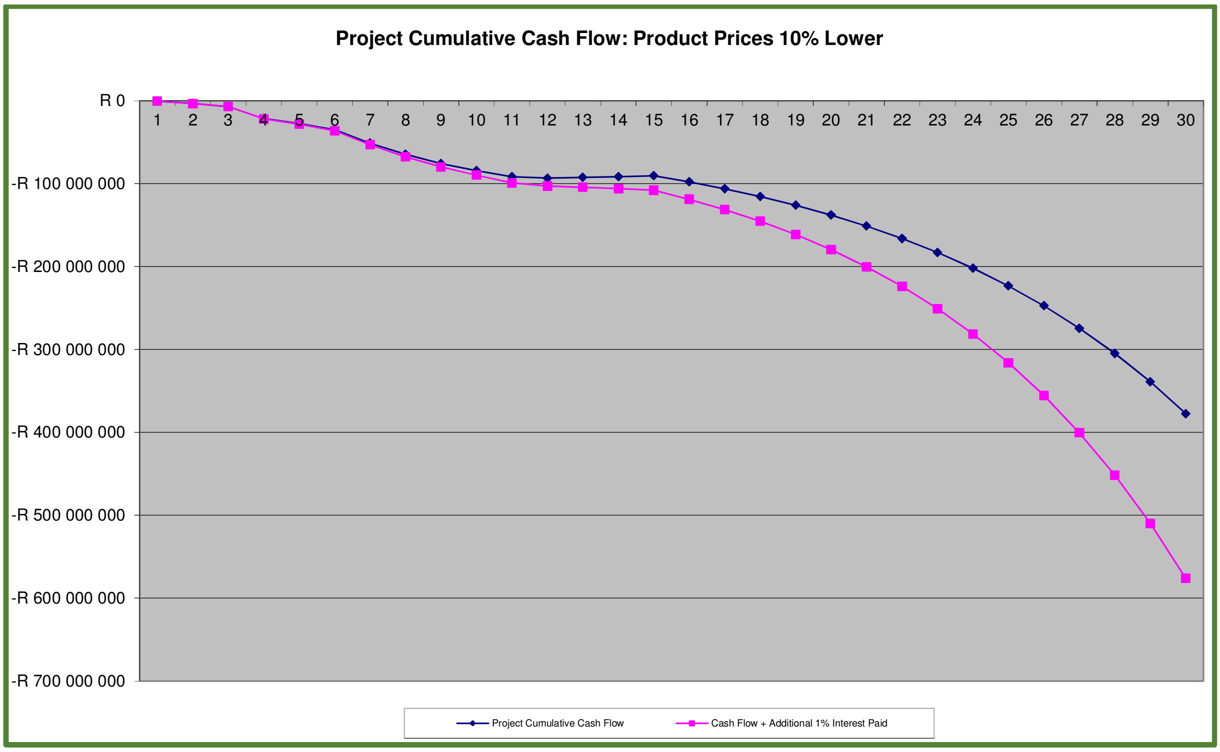

Figure 14. Project cumulative cash flow: product prices 10% lower

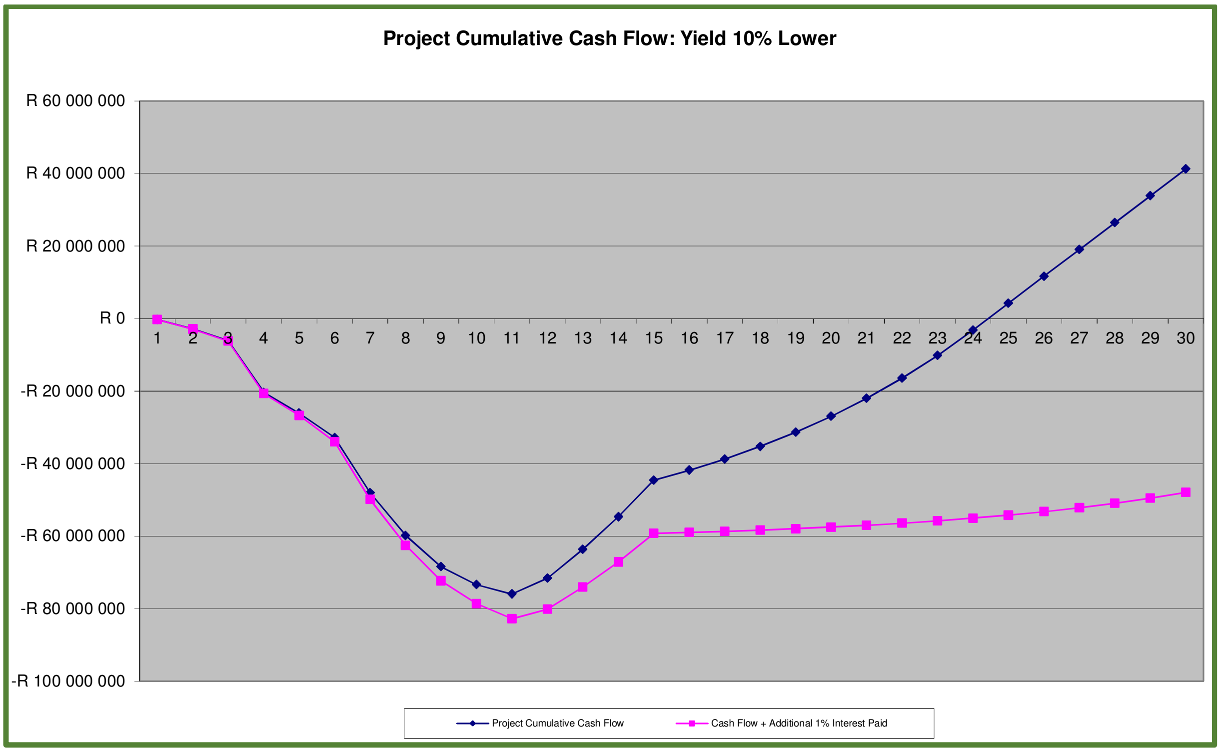

Figure 15. Project cumulative cash flow: Yield 10% lower

In Figure 16 it is indicated that the maximum cumulative shortage by Year 11 amounts to –R76.0 million and the interest load results in a slow recovery to break even only at Year 25. Under this reduced yield situation the development pace should be slowed down and/or a higher grant/own funding contribution should be introduced, probably 90%.

It is estimated that the entire scheme has the ability to create 129 full time jobs and that the total permanent equivalent jobs will be equal to 707 full time jobs.

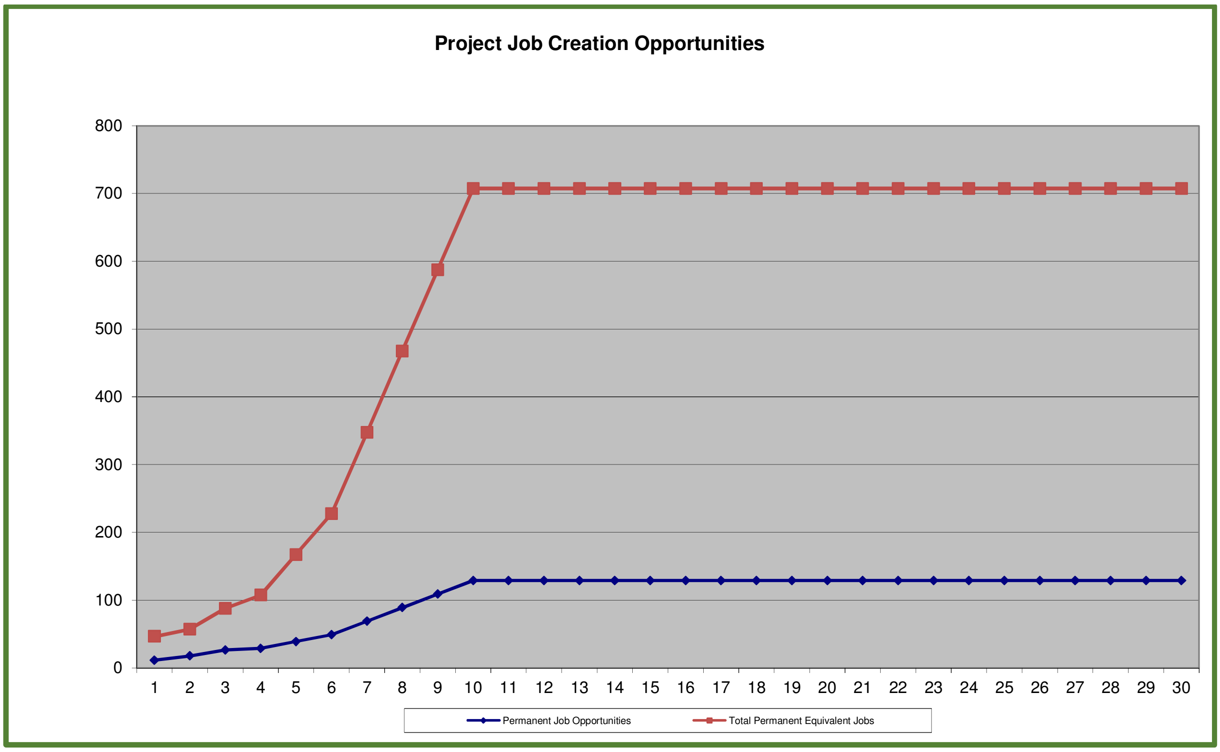

Figure 16. Job creation opportunities

To measure the later income stream generated by the project against the initial investment in development cost of the project (grant funding and value of additional 200 ha water included), the Net Benefit/Investment (NB/I) Ratio was calculated by discounting all investments and benefits (net income generated) to Year 1 and comparing them as a ratio. The NB/I Ratio for the project is indicated in Figure 17.

For the budgeted scenario a NB/I Ratio of 3.55 is calculated, indicating that the discounted value of downstream (future) net income from the project over the 30-year period equals R3.55 for every R1.00 discounted investment (development cost) over the first twelve years while the net cumulative cash flow is negative.

With the reduced price and yield scenarios the future net cash flow is lower and will thus return a lower ratio. The calculated NB/I Ratio for the two scenarios are very low, but will increase if grant/own funding is increased and/or pace of development is slower.

18. Comparison and Conclusions

From the above it is eminent that the situation of the existing 300ha production of the Onseepkans irrigation scheme will not be able to sustain the high cost of infrastructure development needed to operate the scheme to make production possible. Continues support from outside funding will be needed to support infrastructure demand.

The increase of an additional 200 ha table grapes production increases the capital outlay needed, but can also make use of the bulk water infrastructure from a pipe system. The increased area of production means that the bulk water infrastructure depreciation is covered by a larger area and decreases the, per unit cost to the entire scheme, making the more marginal existing irrigation land also viable.

From an economic and financial feasibility and viability perspective, the increased production from the increased area is advantageous and the investment of the bulk water infrastructure for Onseepkans irrigation scheme can only be justified if the additional funds and prospective partners could be found to develop the additional irrigation land. It should still be noted that the proposed new development will need a very high level of own funding to ensure successful development.

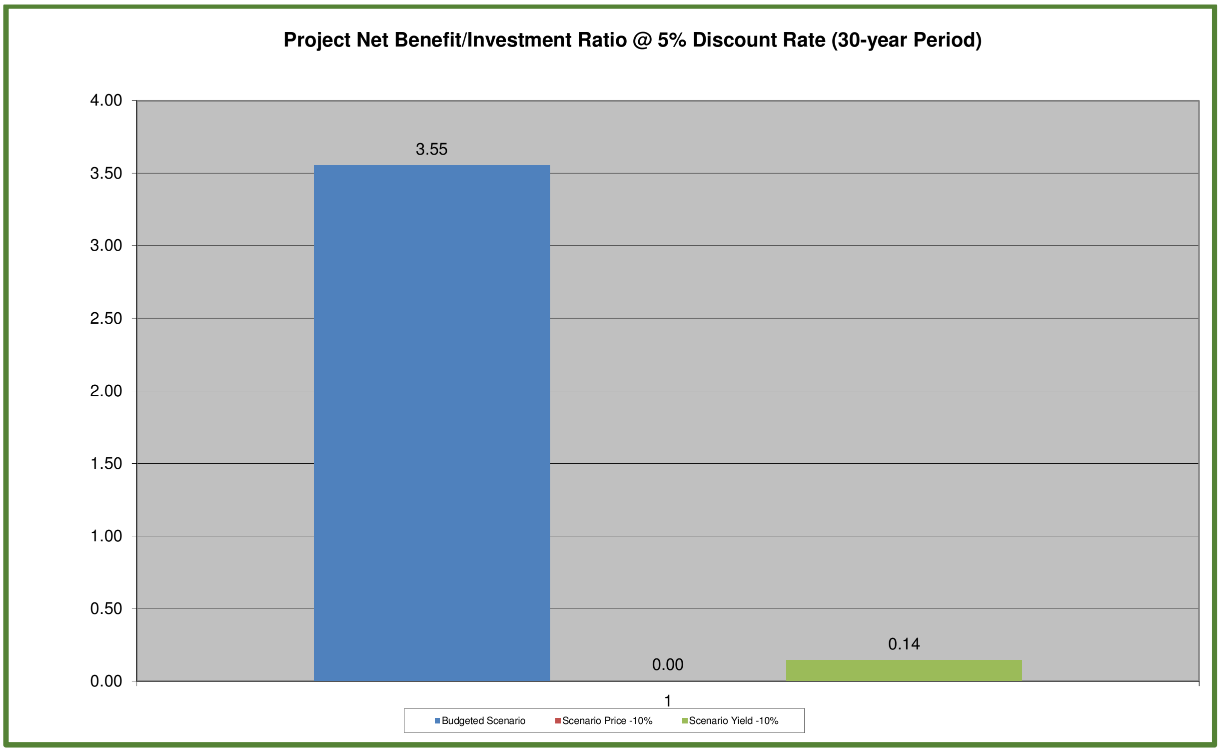

Figure 17. Project net benefit/investment ration @ 5% discount rate (30 year period)

19. Funding Strategy

Approximately R 300 million will be required over a five year period. A number of agencies have been identified for the partial funding and/or financing of the project. These include:

- Government agencies through:
  - Conditional Grant Funds (CASP, ILLIMA)
  - Department of Agriculture, Land Reform and Rural Development
  - Asgisa
- Land Bank
- Development Bank of SA
- I.D.C
- D.T.I
- N.E.F

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