APPENDIX 22

JOHAN JORDAAN & JAN GROENEWALD AGRICULTURAL POTENTIAL EVALUATION

An evaluation of the agricultural potential of the remainder of portion 7 of the farm Buffelsfontein no. 204, Herolds Bay, George Municipality

Johan Jordaan & Jan Groenewald

johan.jordaan@nmmu.ac.za

groenewald@netralink.com

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Executive Summary

This document contains an objective and scientifically based conceptual evaluation of the agricultural potential of the farm Buffelsfontein 204 (remainder of Portion 7). The terms of reference of the study were to determine the most appropriate type of farming enterprise and the potential viability thereof, given the possible need to erect physical infrastructure and obtain other capital items; furthermore to comment on the significance of this land and the appropriate agricultural enterprise on it relative to agriculture within the George environs so as to form an opinion on the impact that rezoning of the farm could have on the agricultural economy.

The evaluation took into consideration a soil analysis of the particular farm, the recent history of previous farm operations, current trends in agriculture in the Southern Cape and the existing infrastructure and natural resource base of the property. Taking all the above into account revealed dairy farming to be an appropriate type of farming enterprise in the area where the farm is located. The viability of a dairy operation was used as a proxy for determining the agricultural potential of the particular farm. The margin of the dairy was comparable with margins attainable from a selection of crops farmed in the area.

The evaluation revealed that a dairy operation yields *low returns* and the land-use for agriculture would in all probability *not be sustainable* over the long term. Three scenarios were evaluated, taking various levels of stocking rates and financing options into consideration. For the most optimistic scenario, a 100-cow dairy unit could be farmed. Financing such a unit at a leverage of 1(equal portions of debt and equity) at an interest rate of 10 % per annum, an after-tax return on investment of 0.42 % is yielded. For an interest rate level of 15% per annum, the return on investment is negative. When the leverage improves to 0.43 (30 % debt : 70 % equity) at an average interest rate of 10 %, a return on investment of just under 2 % is yielded. At an interest rate of 15 %, the return drops to under 1%. Therefore, it seems the potential return of the particular enterprise moves in a band of 2 % and below, which cannot be regarded as a sufficient return considering a capital investment of about R 3, 9 million for a dairy unit of this scale. Since data and norms were sourced from farmer study groups in the area, the calculated returns for this farm may be slightly overstated as it is a known fact that farmers belonging to study groups

generally perform better than the average producer. Data were corrected for average producers by lowering the outputs by 10 %. Return on investment drops to negative figures in all scenarios. Investing money in the bank (relatively risk-free) would generally yield a much higher return than what the farm seems to be capable of generating (with the associated risks of agriculture).

If the farm has to finance its capital investment and operations (like most farms are forced to do), the annual payment of loans does not leave enough earnings for satisfactorily *remunerating the operator*, nor providing for *financing any future growth*. The unit seems to be too small for generating a sustainable living; the unit cannot yield a personal disposable income commensurate with what an able manager can earn elsewhere.

The farm is *too small to take advantage of the economies of scale*. The smaller the unit when investing in productive agriculture, the more intensive the operations need be to generate satisfactory returns. Intensification is usually *capital intensive rather than labour intensive* and demand higher levels of entrepreneurial, technical and managerial competencies. Combining substantial capital investments needed for intensive operations on small units with the already high prices of agricultural land in the area puts the farming unit at risk, both in terms of *business risk and financial risk.*

Intensification of operations on small units is often more *detrimental to the environment* than low-input systems on larger tracts of land. Intensification is usually associated with bulk infrastructure, e.g. tunnels, silos, processing units, chemical storage tanks, and the like on agricultural units. Pressure on natural resources such as the over-utilization of land and water or the intensification of operations which potentially produce effluents and pollutants may create unintended consequences and additional *environmental and social externalities*.

In terms of dairy production, the farm's *potential contribution to the regional economy* amounts to 0.702 % and in terms of contribution to Western Cape dairy production about 0.101 %, which is fairly insignificant. In terms of monetary value of output, the same trend would apply. Since there has not been any real significant agricultural output on the farm over the last number of

years, rezoning the property would only mean a loss of *potential contribution* to agricultural output and not actually any loss of current physical or economic output.

The location of Buffelsfontein 204 amidst existing and expanding high-end residential properties and golf estates renders this piece of land practically *unsuitable for conventional farming*. To preserve this land as agriculturally zoned land may develop potential environmental and social externalities forced by intensification of agricultural operations on such a small unit. On the other hand, the capital investment in land due to excessive land prices simply *forces the farm out of agricultural use* since the return on capital invested in agriculture is generally much lower than in other industries.

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1. Introduction

This document contains an objective and scientifically based conceptual evaluation of the agricultural potential of the farm Buffelsfontein 204 (remainder of Portion 7).

The terms of reference of the study were stated as follows:

1. determine the most appropriate type of farming enterprise and the potential viability thereof, given the possible need to erect physical infrastructure and obtain other capital items
2. comment on the relative significance of this land and the appropriate agricultural enterprise on it in relation to agriculture within the George environs and the impact on the agricultural economy should this farm be rezoned

To give effect to the above terms of reference, the analysis takes into consideration the soil analysis done by Robertson (2003) for the particular farm, the recent history of previous farm operations, current trends in agriculture in the Southern Cape and the existing infrastructure and natural resource base of the property. Standard agricultural economic methodology was applied in the study.

2. Appropriate type of farming enterprise

The soil analysis report states that the farm has a potential for growing vegetables and soft citrus as crop enterprises and dairying on cultivated pastures as a livestock enterprise. Choosing the most appropriate enterprise on any given piece of agricultural land is however influenced by a host of other factors, in addition to the soil potential. In order to produce a particular crop or livestock enterprise, the availability of other complementary resources such as water, climate, capital and entrepreneurial/managerial competencies play a role. Furthermore, the economics of different enterprises needs to be taken into account, which in turn is dependent on various other variables such as a demand for the product, the purchasing power of the consumer, the availability of a market for trading, current market trends, and many more.

Recent trends in the Southern Cape have shown a movement away from vegetable production ever since the canning factory in Mossel Bay closed down a few years ago. The frozen vegetable factory in George recently experienced a huge lay-off of staff as well, due to a major downscaling of operations. Although there has been a swing in consumer preferences away from

canned or frozen vegetables toward fresh produce, the Southern Cape is at a locational disadvantage concerning the marketing of fresh vegetables.

Based on observation alone, no trace of soft citrus crops can be found in the immediate vicinity. Those that were attempted are more towards Karatara / Knysna, quite some distance away, but no meaningful citrus expansion occurred in the Southern Cape.

Two main observable trends in the area is the conversion of traditional crop farming into either more intensive forms of crop production, the most noticeable being strawberries in environmentally-controlled tunnels, or converting arable land to cultivated pastures for intensive dairy production. Producing intensive crops in tunnels requires a high level of technical and managerial expertise; derelict and abandoned tunnels on many farms in various parts of South Africa bear witness to the fact that many more ventures were started than have succeeded.

The history of the farm Buffelsfontein 204 reveals no real commercial farming activities for profit for the past number of years. The last noticeable agricultural operation was a small dairy farming operation, some time prior to the sale of the property to the current owners; the owners immediately before the present owners used the property for horses on a non-commercial basis. Dairying on cultivated pastures is expanding countrywide, and significantly so in the coastal areas of South Africa. In the George area the dairy herd numbers has indeed increased with 65 % and milk production with 54 % since 1998, according to figures from a local study group. Dairy farming is becoming one of the dominant agricultural enterprises found in the Southern Cape. Investment in dairy processing and distribution facilities in the region has also grown in the recent past.

Based on the aforementioned, this report shall focus on the viability of a dairy operation as a proxy for determining the agricultural potential of the particular farm. The analyses to follow are based on data sourced from the Department of Agriculture, current dairy farmers and published information. The data sourced from dairy farmers pertain to the results of dairy farmers' study groups in the area of George, serviced by scientists and economists of the local Department of Agriculture.

3. Infrastructure and resources needed to establish and operate a farm operation

3.1. Livestock

In pasture-based dairy systems in the Southern Cape, the stocking rate norm ranges between 1.5 cows in herd (CIH) per hectare and 2.5 CIH per hectare. If land availability of about 45 hectares out of the total 65 hectares is assumed for the particular farm (according to the soil analysis), the potential carrying capacity of the farm could range between 80 and 100 CIH. Table 1 depicts the typical herd size and composition of a 100-cow unit. A 100-cow dairy unit will normally consist of a total of 140 large stock unit (LSU) animals with an average value estimated at R 7 085 per CIH.

Table 1. Typical herd structure for a 100-cow unit

Herd composition	No. of animals	Value per unit
Cows in milk (CIM)	80	5000
Dry cows (DC)	20	5000
Pregnant heifers	14	4500
Heifers weaning to 1st service	26	3000
Heifers birth to weaning	45	1500
Total Animals (TA)	**185**	
Total mature livestock units (MLU)	142	
Total cows in herd	**100**	
Average value per CIH		**R 7,085**
Total Heifers (TH)	**85**	

3.2. Pasture crops

Kikuyu, a perennial summer grass that spreads by underground roots and aboveground runners, is the dominant grass currently on the property. Due to the farm laying fallow for a number of years, the existing pastures are weed-infested and also formed a dense mat that influences productivity of the pasture negatively; it is unpalatable and generally of poor nutritional value when in such a state. Although Kikuyu can be slashed with some success to create new vigour, a comprehensive soil preparation operation could be required to re-establish pastures in order to utilize the farm effectively. It is assumed that a total of 45

hectares of land are available for pasture establishment. Table 2 gives an indication of the average establishment cost of the most common pastures used in the Southern Cape. The cost of re-establishing the pastures on the farm may range between R 2 000 and R 4 500 per hectare.

Table 2. Cultivated pastures: establishment cost/ha under permanent irrigation

	Type of pasture				
	Kikuyu/ Rye establish	**Kikuyu/ Rye sow-over**	**Kikuyu/ Clover sow-over**	**Kikuyu / Grass/Clover sow-over**	**Grass/ Clover establish**
Lifespan of pasture crop	10	1	2	2	3
Establishment cost:					
Variable costs	1,564	660	1,392	1,535	1,228
Seed	300	195	392	526	562
seed treatment	0	0	36	36	36
Fertilizer	581	354	644	644	290
Other	9	9	9	9	9
cultivation costs	674	102	312	321	331
Fixed costs	827	198	478	510	466
cultivation costs	611	98	277	286	295
Labour	66	6	17	18	19
interest on operating capital	151	95	184	206	152
Total establishment cost	**R 2,391**	**R 858**	**R 1,870**	**R 2,045**	**R 1,694**
Maintenance cost (year of establishment)					
Variable costs	1,338	3,059	1,080	1,086	423
Fertilizer	962	2,647	0	0	0
Chemicals	0	0	42	42	42
Electricity	284	284	948	948	284
Water	64	64	64	64	64
cultivation costs	27	64	26	32	32
Fixed costs	249	570	203	211	98
cultivation costs	25	57	23	30	30
Labour	1	3	1	2	2
interest on operating capital	223	509	179	179	66
Maintenance cost (year of establishment)	**R 1,587**	**R 3,629**	**R 1,283**	**R 1,297**	**R 520**
Total establishment cost/ha	**R 3,978**	**R 4,487**	**R 3,153**	**R 3,341**	**R 2,214**

For annual maintenance of pastures, the dominant practice in this region is the over-sowing of kikuyu pasture during winter with annual pasture crops that can be utilized for grazing during the period when kikuyu is not in production. Italian rye grasses or short-season

Westerwold-type rye grasses are mainly used for over-sowing. These grasses can be established on their own or with legumes such as perennial white or red clovers.

3.3. Irrigation

Permanent irrigation systems, in combination with moveable spray irrigation systems, are mostly used on pastures. Relatively light, frequent irrigations are more efficient on pastures than heavy irrigations. Low volume sprinklers keep the topsoil damp and prevent the loss of irrigation water and nutrients through run-off. Irrigation strips of 10 - 12 meters wide are usually recommended and upright emitters are also used for electric fencing posts to manage rotational strip-grazing. A robust estimation of establishing irrigation on a dairy farm amounts to about R3 500 per CIH.

3.4. Physical infrastructure

A rough indication of potential physical infrastructure typically needed to run an operation of a 100-cow unit is given below. Obviously a more detailed infrastructure planning exercise needs to be done to determine a more exact indication of infrastructure needed for this farm. Following is a list of physical infrastructure requirements:

- *Buildings and other fixed improvements*
    - milking parlour / farm office / milk storage tank rooms / kraals and handling facilities for a 10 point milking facility
    - shed for feed / machinery / implements storage
    - 2 x sedimentation dams (to handle wastewater)
    - Permanent fencing (1.2m height) supplemented with electric fencing
    - 2 x Permanent labour houses (30 m^2 each)
    - Calf-rearing pens
    - Permanent sprinkler irrigation systems
    - Storage dam for irrigation (±1800 m^3)
- *Machinery and equipment*
    - Milking machine (10 point herringbone)
    - Milk tank (± 2 500 litre)
    - Tractor and soil tillage implements
    - Specialized tillage equipment, e.g. mulcher for over-sowing of kikuyu

- Feed and fodder equipment, e.g. baler, wrapper
- Pumps, pipelines for supplying irrigation water

The total capital outlay for physical infrastructure is discussed further under section 4 of the document.

3.5. Water

The water demand of a dairy production enterprise needs to take into account the water required for pasture irrigation, animal drinking water requirements as well as the amount of water needed at the milking parlour for cleaning purposes. An estimate of the total annual water requirement of the operation amounts to 319 325 kiloliter in a normal rainfall year, assuming above average management. This requirement needs to be reconciled with the available water abstraction allocation for the farm. The water requirements are as calculated below.

- **Irrigation requirements**

  Water irrigation requirements were determined by considering the total annual rainfall, the annual water requirements of the most common pasture species and the area of irrigation. Kikuyu/ryegrass pasture requires 1 400 mm rain per year for optimal production. As the average annual rainfall only provides ± 700 mm, the average annual water deficit of 700 mm has to be provided for by means of irrigation. The absolute minimum irrigation requirement therefore amounts to 315 000 kiloliters of water per year for 45 hectares of cultivated pasture. A more accurate assessment of water demand for irrigation can be made when taking into account factors like evapo-transpiration, crop irrigation factors, effective rainfall and irrigation design.

- **Drinking water requirements**

  Water intake is influenced by daily temperatures and the volume of milk produced by a cow. Each mature animal on average utilizes ±75 liters of water per day. Based on the herd structure of a 100-cow unit, the total requirement of the animals amount to 10 650 liters per day and a total of 3 887 kiloliters per year.

- **Milking parlour water requirements**

  The norm for the day-to-day water requirements to clean the parlor, machinery and equipment is 15 liters per day for every cow that is milked. On average, 80% of the

cow herd is in lactation, resulting in ± 1200 liters of water required per day and a total of 438 kiloliters per year for a 100-cow unit.

4. Capital outlay for establishing a dairy operation

Capital outlay will depend on the size of the operation, which in turn is dependent inter alia on the amount of land that is available, the type of pastures, the stocking rate, number of animals on the land and nature of the infrastructure to be erected. More detailed infrastructure planning is needed to determine the extent of capital investment for the particular farm. In the absence of such a detailed infrastructure plan, an order of magnitude figure is calculated by estimating the value of the capital outlay to be made for a dairy unit of the scale as indicated. An estimate of capital investment is depicted in Table 3. Fixed improvements (buildings, fences, irrigation, waste disposal dams etc.) amount to R 1 111 757; machinery and implements amount to a conservative R 305 000 and livestock to R 708 500, bringing the total capital outlay (excluding the value of undeveloped land) to R 2 125 257.

According to land transactions registered in the Deeds Office and reported in the *Landbouweekblad* over the period August – October 2005, farm prices range from R 30 000 to R 60 000 per hectare, with a "straight" average of R 44 000 per hectare. If the price of R44 000 per hectare was applied to this property, it would amount to a value of R2 860 000 for the farm (including fixed improvements but excluding livestock and machinery). The farm value per CIH amounts to R 28 600. Adding the capital investment needed in machinery and livestock, the capital investment increases to R 38 735 per CIH. This relates to an average total capital investment of R 59 592 per hectare, which is still slightly less than the upper range of R60 000 per hectare that farmland (land and fixed improvements) is currently trading for.

Current norms obtained from dairy study group figures estimate the capital investment at between R 28 000 and R30 000 per CIH, which most probably does not fully reflect the high land prices yet. A total capital investment of R 38 735 per CIH is assumed for this study.

Table 3. Typical initial capital outlay for developing a 100-cow dairy farming operation

Item	Size	Unit	Quantity	Price	Total
Milking parlour / milk tank rooms/ farm office /kraals	15 x 20 m	point	10	15,000	R 150,000
Calf rearing pens	6	unit	8	1,500	R 11,250
Shed for feed storage	15 x 10 m	m^2	150	320	R 48,000
Sheds for machinery/implements	15 x 10 m	m^2	150	900	R 135,000
Storage dams for irrigation	1800 m^3	unit	1	75,000	R 75,000
Sedimentation dams		unit	1	25,000	R 25,000
Permanent border fencing		km	3.645	8,000	R 29,160
Permanent inside fencing / strip grazing electric fence		km	5	8,000	R 40,000
Permanent sprinkler irrigation systems (incl.pumps & pipes)		ha	45	7,719	R 347,334
Permanent labour houses	2	m^2	30	1,200	R 72,000
Pature establishment		ha	45	3,978	R 179,014
Total fixed improvements					**R 1,111,757**
Milk tanks	2500 l	unit	1	15,000	R 15,000
Milking machine		point	10	9,000	R 90,000
Tractors	65 KW	unit	1	80,000	R 80,000
Implements (tillage/mulcher/baler/wrapper/equipment)		unit	1	120,000	R 120,000
Total machinery implements and equipment					**R 305,000**
Dairy animals (see herd composition)		CIH	100	7,085	R 708,500
Total livestock					**R 708,500**
Total Capital outlay (excl. land)					**R 2,125,257**
Total Farm value (land & fixed improvements)					R 2,860,000
Total Farm value/ CIH (land & fixed improvements)					R 28,600
Capital investment in Machinery / CIH					R 3,050
Capital investment in Livestock / CIH					R 7,085
Total capital investment per CIH					**R 38,735**
Total capital investment per hectare farm					**R 59,592**

5. Potential economic viability of a dairy operation

The amount of land allocated for pasture establishment, the type of pastures established, the animal stocking rate per area, water availability and ultimately the management capabilities are crucial variables in determining the potential economic viability of the operation. Apart from that, the financing of the proposed operation, i.e. the leverage ratio (debt : equity) and interest rates can further influence the feasibility and sustainability of any operation.

5.1. Methodology and assumptions for determining economic viability

The potential economic viability of the operation is expressed in terms of the following on an annual basis:

- *gross margin (contribution margin)*; gross margin is calculated as gross income less allocated direct costs. This measure reflects the ability of an enterprise to contribute to covering overhead costs and is also a convenient measure to use for making comparisons between different enterprises
- *net margin above specified cost*; net margin above specified cost is roughly equivalent to EBIT (earnings before interest and tax) or Net Farm Income (in agricultural economic terms) and takes both direct allocated costs and overhead costs into consideration. It provides a measure of the return on all the assets employed in the business, irrespective of the costs and sources of financing of the assets. This is a convenient measure for comparing the returns between different businesses.
- *net profit before tax*; net profit before tax reflects the return on assets after the remuneration of providers of external funds (e.g. interest) and is a convenient measure to use in determining the return on equity capital.
- *net profit after tax;* this reflects the amount available for servicing of the capital redemption portion of existing loans, the amount available for new growth or investments and finally the availability of profits for remuneration to the owners (e.g. dividend payments or drawing a salary by the owner in the case of a sole proprietorship). In order to express the economic viability in terms of *net profit (before and after-tax),* further assumptions are needed with regard to tax rates, interest rates and leverage (debt : equity), all of which is highly dependent on personal preference and financing policy of the owner/manager.

Three different scenarios are presented in order to account for some of the variables that influence profitability of the proposed venture. All scenarios assume a total arable area of 45 hectares established with a mixture of kikuyu / ryegrass / clover pastures. The applicable marginal tax rate as published by SARS for the 2005 financial year is used in all calculations. Annual depreciation is calculated on fixed improvements and machinery at 4 % and 15 % respectively. The following scenarios are presented:

- Scenario 1(optimistic): an average stocking rate of 2.2 cows in herd per hectare (CIH/ha), with 2 options for leverage, i.e. a 50 : 50 ratio of debt : equity and a 30 : 70 ratio respectively, each with two interest rate options, i.e. 10 % and 15 %.
- Scenario 2 (average): an average stocking rate of 2.0 CIH/ha with 2 options for leverage, i.e. a 50 : 50 debt : equity ratio and a 30 : 70 ratio respectively, each with two interest rate options, i.e. 10 % and 15 %.
- Scenario 3 (realistic): an average stocking rate of 1.8 CIH/ha with 2 options for leverage, i.e. a 50 : 50 debt : equity ratio and a 30 : 70 ratio respectively, each with two interest rate options, i.e. 10 % and 15 %.

It is generally recognized among farm economists that study group members usually tend to be above-average managers whose results, particularly their profitability, are also above-average. In order to get an idea of how an average farm manager will fare on the property, the effect of a 10 % lower output shall also be reported for each of the above scenarios.

The crucial element for assessing the viability of the operation is to consider the *long term sustainability* of the operation. A simple analysis involves asking three questions: firstly, is the potential profit after tax sufficient to pay back the capital portion of loans under the long term leverage preferred by the operation; secondly, after the capital portion of loans are paid back annually, is there sufficient money left to remunerate the owner of the business for his/her managerial and entrepreneurial talent employed in the operation (operators remuneration or "salary"); lastly, after a salary has being paid for the owner, is there sufficient money left over to finance future growth and investment.

For the purposes of this study, operator's remuneration is conservatively assumed at R 96 722 per annum. This is based on a survey conducted in 1990 on farm managers' salaries (Laubscher *et al*, 1991). According to the survey, 80% of managers earning less than R30 000 per annum were on farms of which the capital value did not exceed R1 500 000. On the other hand, 80% of the managers earning more than R 60 000 per annum were on farms of which the capital value exceeded R1 500 000 and of these 77% held degrees or diplomas. Indices as published in the National Department of Agriculture 2005 *Abstract of Agricultural Statistics* were used to convert these figures to 2005 numbers. It is assumed that the earnings of farm managers increased at the same rate as the consumer price indices (all items) as

published in the *Abstract.* An income of R30 000 in 1990 is therefore estimated to be equivalent to R 96 722 in 2005 and an income of R60 000 in 1990 is equivalent to R193 443 in 2005. A farm capital value of R1 500 000 in 1990 is equivalent to a capital sum of R5 401 330 in 2005. The viability of the respective scenarios is presented in Tables 4 - Table 9.

5.2. Economic viability of Scenario 1 (2.2 CIH/ha)

The viability of Scenario 1 (2.2 CIH/ha) is presented in Table 4 below.

Table 4. Economic viability of Scenario 1 (2.2 CIH/ha)

Total hectares				45
Stocking rate (CIH/ha)				2.2
Total cows in herd (CIH)				100
Capital investment				
Leverage ratio		**50 : 50**		**30 : 70**
Capital investment (incl. land)		R 3,873,500		R 3,873,500
Debt	50%	R 1,936,750	30%	R 1,162,050
Equity	50%	R 1,936,750	70%	R 2,711,450
Net margin above specified costs (EBIT)				
		TOTAL		
GROSS INCOME		**960000**		
Product income		934,800		
Trade income		20,400		
Other income		4,800		
TOTAL COST		**750,220**		
ALLOCATED DIRECT COSTS		**554,400**		
Feed costs:		**487,200**		
-Concentrate: Purchased		279,600		
-Concentrate: Produced		0		
-TMR: Purchased		4,800		
-Roughage: Purchased		10,800		
-Roughage: Produced		192,000		
Other costs (excl. feed):		**67,200**		
Medical and Vet		31,200		
AI		12,000		
All other		24,000		
FIXED COSTS		**195,820**		
Labour		67,200		
Depreciation		90,220		
All other		38,400		
GROSS MARGIN (contribution margin)		**405,600**		
NET MARGIN ABOVE SPECIFIED COSTS (EBIT)		**R 209,780**		

From Table 4 it is evident that a gross income of R 960 000 can be realized per year. Directly allocatable costs of the operation amount to R 554 400, with feed cost amounting to R 487 200. Feed costs are one of the major costs in a dairy operation and may easily constitute more than 50 % of the income and up to 75 % of total costs. Although concentrates usually makes up the greater part of feed cost, self-produced roughage can easily constitute one third or more of feed costs. In a pasture-based system, this emphasizes the importance of establishing quality pastures and irrigation systems. The gross margin for Scenario 1 amounts to R 405 600 per year. With fixed costs taken into account, a net margin above cost (EBIT or NFI) of R 209 780 can be realized per year. Reducing the output by 10 % to make provision for assessing the performance of a more average producer reveals an EBIT of R 113 780.

In order to determine the net profit of the operation, the financing costs of the operation need to be taken into account. Taking different financing scenarios into consideration, the effect on net profit of the operation can be determined. Table 5 depicts the effect of financing at two different levels and two different interest rate scenarios on net profits of the operation.

Table 5. Effect of financing and interest rates on profitability of Scenario 1.

Potential Net Profit at various leverage ratios and interest rates				
	50 : 50 leverage ratio		30 : 70 leverage ratio	
Interest rate	10%	15%	10%	15%
Potential interest cost	R 193,675	R 290,513	R 116,205	R 174,308
Net profit before Tax (EBT)	**R 16,105**	**-R 80,733**	**R 93,575**	**R 35,472**
Tax	R 0	R 0	R 18,213	R 585
Net profit after Tax (PAT)	**R 16,105**	**-R 80,733**	**R 75,361**	**R 34,887**
Before-tax return (EBIT) on total investment	5.42%	5.42%	5.42%	5.42%
After-tax return (PAT) on investment	0.42%	-2.08%	1.95%	0.90%
Instalment on loan	R 227,490	R 309,418	R 136,494	R 185,651
Amount available for operators remuneration	**-R 17,710**	**-R 99,638**	**R 55,072**	**R 23,544**
Assumed operators remuneration	R 96,722	R 96,722	R 96,722	R 96,722
Surplus / deficit available for expansion	**-R 114,432**	**-R 196,360**	**-R 41,650**	**-R 73,178**

Assuming a debt : equity ratio of 50:50 and a 10% interest rate, the net profit before tax amounts to only R 16 105 (the average producer with 10 % less output would incur a loss).

With the applicable marginal tax rates and allowed tax threshold, the net profit after tax amounts to R 16 105 since no tax will be payable. This relates to an after-tax return on investment of less than half a percent (0.4 %). At a 15 % interest rate, and a leverage level of 1, the farm would incur a loss.

Assuming a debt : equity ratio of 30:70 and a 10% interest rate, the net profit after tax amounts to R 75 361 (the average producer with 10 % less output would incur a loss). This relates to an after-tax return on investment of 1.95 %. At a 15 % interest rate, the net profit after tax amounts to R 34 887. This relates to an after-tax return on investment of 0.9 %.

Assessing the sustainability of the operation reveals that in no circumstances will the operation be in a position to remunerate the operator at the assumed "salary" of R 96 722 per annum. The maximum salary that the operation can afford to pay is R 55 072 in the case of a 30:70 leverage at an interest rate of 10 % in the market; not quite a significant return for managing a R 3 million investment. Even worse, no money will be available to finance future growth and expansion. Despite a gross income of nearly R 1 million and a potential net profit after tax of R 75 361 under the most favorable scenario, the long term sustainability of such an operation is questionable, even with results commensurate to those of study group members; the position is clearly much worse for "average" managers who can expect smaller yields, incomes and profits.

5.3. Economic viability of Scenario 2 (2.0 CIH/ha)

The viability of Scenario 2 (2.0 CIH/ha) is presented in Table 6. A gross income of R 864 000 can be realized per year. Gross margin for Scenario 2 amounts to R 365 040 per year. Directly allocatable costs amount to R 498 960. Taking fixed costs into consideration a net margin above cost (EBIT) of R 188 802 is realized per year. Reducing the output by 10 % to make provision for assessing the performance of a more average producer reveals an EBIT of R 102 402.

Taking different financing options into consideration, the effect of financing and interest rates on net profits of Scenario 2 is presented in Table 7. Assuming a debt : equity ratio of 50:50 and a 10% interest rate, the net profit before tax amounts to R 14 494. With the

applicable marginal tax rates and tax threshold, no tax will be payable and the net profit after tax remains stays R 14 494 (an average producer would incur a loss).

Table 6. Economic viability of Scenario 2 (2.0 CIH/ha)

Total hectares				45
Stocking rate (CIH/ha)				2.0
Total cows in herd (CIH)				90
Capital investment				
Leverage ratio		**50 : 50**		**30 : 70**
Capital investment (incl. land)		R 3,486,150		R 3,486,150
Debt	50%	R 1,743,075	30%	R 1,045,845
Equity	50%	R 1,743,075	70%	R 2,440,305
Net margin above specified costs (EBIT)				
		TOTAL		
GROSS INCOME		**864,000**		
Product income		841,320		
Trade income		18,360		
Other income		4,320		
TOTAL COST		**675,198**		
ALLOCATED DIRECT COSTS		**498,960**		
Feed costs:		**438,480**		
-Concentrate: Purchased		251,640		
-Concentrate: Produced		0		
-TMR: Purchased		4,320		
-Roughage: Purchased		9,720		
-Roughage: Produced		172,800		
Other costs (excl. feed):		**60,480**		
Medical and Vet		28,080		
AI		10,800		
All other		21,600		
FIXED COSTS		**176,238**		
Labour		60,480		
Depreciation		81,198		
All other		34,560		
GROSS MARGIN (contribution margin)		**R 365,040**		
NET MARGIN ABOVE SPECIFIED COSTS (EBIT)		**R 188,802**		

An after-tax profit of R 14 494 yields an after-tax return on investment of 0.42 %. At a 15 % interest rate, a loss is incurred. Assuming a debt : equity ratio of 30:70 and a 10% interest rate, the net profit after tax amounts to R 68 343 (an average producer would incur a loss). At

a 15 % interest rate, the net profit after tax amounts to R 31 925, yielding a return of less than 1 %.

Table 7. Effect of financing and interest rates on profitability of Scenario 2.

Potential Net Profit at various leverage ratios and interest rates				
	50 : 50 leverage ratio		30 : 70 leverage ratio	
Interest rate	10%	15%	10%	15%
Potential interest cost	R 174,308	R 261,461	R 104,585	R 156,877
Net profit before Tax (EBT)	**R 14,494**	**-R 72,660**	**R 84,217**	**R 31,925**
Tax	R 0	R 0	R 15,874	R 0
Net profit after Tax (PAT)	**R 14,494**	**-R 72,660**	**R 68,343**	**R 31,925**
Before-tax return (EBIT) on total investment	5.42%	5.42%	5.42%	5.42%
After-tax return (PAT) on investment	0.42%	-2.08%	1.96%	0.92%
Instalment on loan	R 204,741	R 278,476	R 122,845	R 167,086
Amount available for operators remuneration	**-R 15,939**	**-R 89,674**	**R 50,083**	**R 21,716**
Assumed operators remuneration	R 96,722	R 96,722	R 96,722	R 96,722
Surplus/deficit available for expansion	**-R 112,661**	**-R 186,396**	**-R 46,639**	**-R 75,006**

Assessing the sustainability of the operation reveals that the operation will under this scenario also not be in a position to remunerate the operator at the assumed "salary" of R 96 722 per annum. Obviously no money will be available to finance future growth and expansion.

5.4. Economic viability of Scenario 3 (1.8 CIH/ha)

The viability of Scenario 3 (1.8 CIH/ha) is presented in Table 8. A gross income of R 777 600 can be realized per year. The gross margin for Scenario 3 amounts to R 328 536 per year. Taking directly allocatable costs and fixed costs into consideration a net margin above cost (EBIT) of R 169 922 can be realized for the operation. Reducing the output by 10 % to make provision for assessing the performance of a more average producer reveals an EBIT of about R 92 162 per annum.

The effect of different financing scenarios and interest rates on net profits of Scenario 3 is presented in Table 9. Assuming a debt: equity ratio of 50 : 50 and a 10% interest rate, the net profit after tax for Scenario 3 amounts to R 13 045, with the average producer still incurring a loss. At a 15 % interest rate level, a loss would also be incurred by the farm.

Table 8. Economic viability of Scenario 3 (1.8 CIH/ha)

Total hectares				45
Stocking rate (CIH/ha)				1.8
Total cows in herd (CIH)				81
Capital investment				
Leverage ratio		**50 : 50**		**30 : 70**
Capital investment (incl. land)		R 3,137,535		R 3,137,535
Debt	50%	R 1,568,768	30%	R 941,261
Equity	50%	R 1,568,768	70%	R 2,196,275
Net margin above specified costs (EBIT)				
		TOTAL		
GROSS INCOME		**777,600**		
Product income		757,188		
Trade income		16,524		
Other income		3,888		
TOTAL COST		**607,678**		
ALLOCATED DIRECT COSTS		**449,064**		
Feed costs:		**394,632**		
-Concentrate: Purchased		226,476		
-Concentrate: Produced		0		
-TMR: Purchased		3,888		
-Roughage: Purchased		8,748		
-Roughage: Produced		155,520		
Other costs (excl. feed):		**54,432**		
Medical and Vet		25,272		
AI		9,720		
All other		19,440		
FIXED COSTS		**158,614**		
Labour		54,432		
Depreciation		73,078		
All other		31,104		
GROSS MARGIN (contribution margin)		**R 328,536**		
NET MARGIN ABOVE SPECIFIED COSTS (EBIT)		**R 169,922**		

Assuming a debt : equity ratio of 30:70 and a 10% interest rate, the net profit after tax amounts to R 62 027. This relates to an after-tax return on investment of 1.98 %. At a 15 % interest rate, the net profit after tax reduces to R 28 732 and still yields an after-tax return on investment of below 1 %.

Assessing the sustainability of the operation reveals the same trend of not being able to remunerate the operator at the assumed "salary" of R 96 722 per annum, nor being able to finance future growth and expansion.

Table 9. The effect of financing and interest rates on profitability of Scenario 3.

Potential Net Profit at various leverage ratios and interest rates				
	50 : 50 leverage ratio		30 : 70 leverage ratio	
Interest rate	**10%**	**15%**	**10%**	**15%**
Potential interest cost	R 156,877	R 235,315	R 94,126	R 141,189
Net profit before Tax (EBT)	**R 13,045**	**-R 65,394**	**R 75,796**	**R 28,732**
Tax	R 0	R 0	R 13 769	R 0
Net profit after Tax (PAT)	**R 13,045**	**-R 65,394**	**R 62,027**	**R 28,732**
Before-tax return (EBIT) on total investment	5.42%	5.42%	5.42%	5.42%
After-tax return (PAT) on investment	0.42%	-2.08%	1.98%	0.92%
Instalment on loan	R 184,267	R 250,629	R 110,560	R 150,377
Amount available for operators remuneration	**-R 14,345**	**-R 80,707**	**R 45,593**	**R 19,544**
Assumed operators remuneration	R 96,722	R 96,722	R 96,722	R 96,722
Surplus/deficit available for expansion	**-R 111,067**	**-R 177,429**	**-R 51,129**	**-R 77,178**

5.5. Internal rate of return

In order to assess the longer term economic viability of the 100-cow dairy operation, the internal rate of return (IRR) of the project was calculated over a 10 year horizon as depicted in Table 10. The IRR reflects the longer term viability of the project, assuming all returns are re-invested in the operation. If a leverage ratio of 30:70 is assumed as the long term preferred leverage, at an interest rate of 10 % per year for both debt and equity contributions, the discount rate amounts to 7 % (based on the weighted average cost of capital). Based on the assumed capital outlay of R 38 735 per CIH and an average income and cost structure as depicted in Table 4 (Scenario1, excluding depreciation), the IRR amounts to 2.94 %, which is

substantially lower than the calculated critical break-even return rate (discount rate) of 7 %. To assess if this return is acceptable for the investor, the return ratios should be compared to a pre-determined target rate of return the business wishes to achieve, or alternatively it could be compared to the bank interest rate at which capital can be invested relatively risk-free (after-tax). In whatever way this operation's IRR is considered, it remains way below market returns and an investment in such an operation would be risky. [1]

Table 10. Internal rate of Return (IRR) : 100 - cow dairy enterprise

Net Present Value (NPV)						
Year	Cash inflow	Cash outflow	Net cash flow	Net cash (after tax)	Discount rate 7%	Present value
0	0	3,873,500	-3,873,500	-2,711,450	1.00	-2,711,450
1	960,000	660,000	300,000	210,000	0.93	196,262
2	1,017,600	699,600	318,000	222,600	0.87	194,427
3	1,078,656	741,576	337,080	235,956	0.82	192,610
4	1,143,375	786,071	357,305	250,113	0.76	190,810
5	1,211,978	833,235	378,743	265,120	0.71	189,027
6	1,284,697	883,229	401,468	281,027	0.67	187,260
7	1,361,778	936,223	425,556	297,889	0.62	185,510
8	1,443,485	992,396	451,089	315,762	0.58	183,777
9	1,530,094	1,051,940	478,154	334,708	0.54	182,059
10	2,338,239	1,115,056	1,223,183	856,228	0.51	435,263
					IRR	**2.94%**

Assumptions			
Leverage ratio	30%	70%	
After tax cost of debt		10%	2.10%
After tax cost of equity		10%	4.90%
Weighted average cost of capital (after tax)			7.00%
Assumed marginal Tax rate			30%
Assumed annual inflation rate			6%
Capital investment based on norm of	R 38,735	per CIH	
Tax legislation effect on initial capital outlay is assumed			
Salvage value of cows only is taken into consideration at project termination			
Salvage value at market value in year 10, assuming average inflation rate			

[1] It may at this stage be prudent to take cognizance of the risk attached to high leverage rates in agriculture. Using a dynamic simulation model, Louw (1979) found that under conditions of risk, a leverage ratio as high as 50:50 has a high likelihood to lead to insolvency. Newer analyses of this type could not been found in the literature, but it is generally acknowledged that South African agriculture is presently a risky business.

The farm seems to be too small in size to generate a reasonable return. The general trend worldwide is for dairy farms to become bigger so as to take advantage of economies of scale. This is indeed the trend in South Africa where dairy units have become bigger, producing more litres per day. Table 11 depicts the change from 1995 to 2004 in the proportion of milk producers that produce different quantities of milk per day. There is a clear trend of the number of smaller producers decreasing while the number of larger producers is increasing.

Table 11. Distribution of daily milk production, 1995 and 2004

Daily production litres/day	% of producers		% of production	
	1995	2004	1995	2004
0 - 500	58	23	19	6
500 - 1000	21	21	20	16
1000 - 2000	13	23	24	35
2000 - 3000	8	12	27	30
> 3000	0	21	10	13

Source: MPO

6. Brief comment on some environmental issues in dairy production

Pollution from animal manure may occur in cases where animals congregate for feeding, water and resting, in proximity to natural water bodies like the Gwaing river and its catchment and run-off areas. Potential pollutants of concern in livestock wastes are organic materials, nutrients and pathogenic microorganisms. Pollution from pesticides and detergents in wash water could also have adverse affects on the environment if not managed correctly. Surface water is primarily affected through soluble contaminants in runoff or insoluble pollutants carried on soil particles during soil erosion events. Groundwater can be contaminated with excessive pollutants from percolation, seepage and direct infiltration. Over-application of fertilizers or manure to pastures can result in leaching of nitrate to groundwater or high levels of nitrogen in surface waters, resulting in eutrophication and low dissolved oxygen levels.

The waste produced and chemicals used by farm operations is an aspect that needs to be incorporated in the overall holistic management of any intensive agricultural enterprise and its

immediate surrounding environment, especially so in this case where the farm is situated near the residential areas of Herolds Bay and Oubaai and borders the Gwaing river system.

7. The viability of crop enterprises

Although a dairy operation is regarded as the most suitable proxy for assessing the agricultural potential of the farm Buffelsfontein 204, some brief reference shall be made to the viability of certain crops found in the immediate area. The gross margin per hectare shall be the unit of analysis for expressing the economic viability of crops. Table 12 depicts the gross margin and margin above cost of a selection of crops relative to the margins of a dairy enterprise.

Table 12. Profitability of selected crops in comparison with dairy

Crop	Location	Gross margin (R/ha)	Margin above cost (R/ha)
Broccoli	George	R 6,667	R 6,172
Cabbage	Boland	R 8,614	R 6,616
Cauliflower	Boland	R 11,322	R 9,478
Green beans	South Cape	R 4,654	R 4,166
Green peas	Boland	R 4,439	R 2,005
Lettuce	Boland	R 3,008	R 1,764
Sweet corn	South Cape	R 3,267	R 2,094
Potatoes	South Cape	R 10,782	R 9,868
Dairy	George	R 9,013	R 6,667

Source: Combuds (Department of Agriculture)

Gross margin, as explained in section 5 of the report, reflects the ability of an enterprise to contribute to covering overhead costs and is also a convenient measure to use for making comparisons between different enterprises with regard to their capacity to cover the total overhead costs of the business. The lower the gross margin, the less the contribution it can make to the overall business success. From table 12 it is evident that most of the crops, except cauliflower and potatoes, have very similar or lower gross margins than a dairy enterprise. The margin above cost is a robust figure of net farm income, or EBIT, as defined in section 5 of the document. A similar trend is observed in the case of margin above cost, with potatoes and cauliflower higher than the dairy enterprise. It is important to note however that vegetables cannot be planted in a monoculture system due to crop pests and diseases, possibly averaging out

the gross margins attainable per year. The soil analysis indicates only 37 hectares of high potential soils available for vegetables. As stated before in this report, circumstances have led to reduced vegetable farming in the area. This may militate against vegetable production on this property.

8. Significance of the farm in relation to agriculture and the impact if rezoned

The farm is relatively small in size, with about 45 hectares that could be utilized for attempting conventional agricultural production. In keeping with a dairy operation as proxy for agricultural potential, the dairy herd of Buffelsfontein 204 would comprise 2.3 % of the herd numbers of the dairy study group in the area. The same trend is expected in the volume of milk production. In terms of turnover, the farm would contribute to 1.89 % of the value of milk produced by the study group. Taking into account that only a small number of farmers, often less than 5 %, normally belong to study groups, these figures are grossly over-estimating the farm's contribution. There are currently 172 dairy farmers in the George, Knysna and Mossel Bay magisterial districts of the Southern Cape region, producing on average 1162 litres of milk per day. Comparing the potential output of the farm with the total milk production of the Southern Cape (George, Knysna and Mossel Bay), reveals a potential contribution by Buffelsfontein 204 of 0.702 % to the regional monthly output of 6 195 784 litres; in relation to the Western Cape output of 42 946 129 litres per month, the contribution of the farm is 0.101 %, which is fairly insignificant. In terms of monetary value of output, the same trend would obviously apply.

Taking the recent history of the farm into consideration, there was no real significant agricultural output. Therefore rezoning the property would only mean a loss of *potential* contribution to agricultural output and *not a loss of actual physical or economic output.*

9. Conclusions

This report concludes that the most likely enterprise to be found on farms in the George area, such as Buffelsfontein 204, is a dairy enterprise. Based on figures of dairy farmers from a local study group, the farm can run between 80 and 100 cows in the herd under conditions of above-average management. The most optimistic scenario would allow for a 100-cow unit. The farm would be able to make an after-tax profit under certain conditions as indicated in the analysis. However, if the farm has to finance its capital investment and operations (like most farms are forced to do), the annual payment of loans does not leave enough earnings for satisfactorily

remunerating the operator. In fact, under no scenario of the analysis a sufficient amount of operator's remuneration is generated, let alone any reserves for future growth and investments. The unit therefore seems to be unsustainable over the long term.

The sustainability of the farm is definitely affected by its small size. Economy of scale is important due to the fact that agriculture is in most instances capital intensive, with the greater proportion of capital investment usually in the form of fixed capital. There is evidence that the dairy industry worldwide is currently expanding unit sizes to seek the benefits from economies of scale. Based on the analyses contained in the report, it is questionable whether a dairy enterprise on this property will be able to attract an entrepreneur or manager of sufficient managerial capacity to manage the dairy unit profitably. The same holds true for any crop production on a commercial scale. The question is really whether the unit can yield a personal disposable income commensurate with what an able manager can earn elsewhere. It is therefore questionable whether the particular farm, due to its size, will present opportunities for entrepreneurs to invest in agricultural operations.

In general, the smaller the unit when investing in productive agriculture, the more intensive the operations need be to generate satisfactory returns. This intensification is usually capital intensive rather than labour intensive. Intensification is usually associated with bulk infrastructure, e.g. tunnels, silos, processing units, chemical storage tanks, and the like on agricultural units. In addition to high capital investments, high level entrepreneurial, technical and managerial competencies are demanded. Adding the already high prices of agricultural land in the area to substantial capital investments needed for intensive operations on small units, puts the farming unit at risk, both in terms of business risk and financial risk.

Intensification of operations on small units is often also more detrimental to the environment than low-input systems on larger tracts of land. Pressure on natural resources such as the over-utilization of land and water or the intensification of operations which potentially produce effluents and pollutants may create unintended consequences and additional environmental and socio-economic externalities.

The location of Buffelsfontein 204 amidst existing and expanding high-end residential properties renders this piece of land practically unsuitable for conventional farming. To preserve this land

as agricultural land may develop potential environmental and socio-economic externalities forced by intensification of agricultural operations on such a small unit. On the other hand, the capital investment in land due to excessive land prices simply forces the farm out of agricultural use since the return on capital invested in agriculture is on average much lower than in other industries.

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11. The authors

Professor Jan Groenewald is an Agricultural Economist, formerly Head of the Agricultural Economics Department of the University of Pretoria. Professor Groenewald holds and M.Sc. (Agric.) from the University of Pretoria, a Ph.D. from Purdue University in the USA and was recently awarded a D.Sc. (h.c.) by the University of the Free State. He currently resides near Mossel Bay in the South Cape. During his career as academic, consultant and researcher, he consulted widely on various matters in agriculture and the economy amongst others, and has experience both locally and abroad. As a researcher, he published some 180 articles in scientific journals and contributed to 6 books. Having spent some time as visiting professor in Canada, the USA and Belgium, he also has a thorough knowledge of the economics of agriculture in a wider international context.

Johan Jordaan is an Agricultural Economist and Senior Lecturer at the Saasveld Campus of the Nelson Mandela Metropolitan University in George. Before joining the PE Technikon in George as Head of the Department of Agricultural Management, he practiced as a farm economist for the Department of Agriculture in the Eastern Cape. Mr. Jordaan consults on various aspects of business development, financing and entrepreneurship in the agricultural sector. Mr. Jordaan holds a B.Sc.Agric. (Hons.) degree from the University of Pretoria and an MBA from the University of Stellenbosch.