Feasibility Study of Wortels Drift Farm Settlement Project, Bedford

Final Report to the Amatole District Municipality

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EXECUTIVE SUMMARY

Presently there are no buildings on the designated part of the farm, however, there is some infrastructure in place. There are two water dams, which are silted, a non-functional windmill, and a water reservoir linked to several livestock watering points. In addition, all access roads within and around the farm are in good condition, together with still relatively good camp fences. A greater portion of the land is infested with termitaries, which reduces the agricultural potential of the land.

The farm, which borders the Nyarha township of Bedford, encompasses the *False Thornveld of the Eastern Cape*. It is relatively flat and very uniform in respect of vegetation, which is open grassland, without any trees or shrubs. The farm has a fairly good forage production potential and resistance to soil erosion. It is divided into a number of fairly small camps with fences and gates in good condition. Seemingly the subdivision was aimed at improving the efficiency of the utilization of the grass since patch (selective) grazing is very evident on the farm. The grazing capacity of the farm is estimated at 5.7 ha/AU, which translates to 88 Animal Units. The size of the farm will be the main limiting factor to its sustainable livestock production.

A soil survey of the farm shows that it has no potential for arable agriculture. The whole farm is mainly covered by shallow soils with frequent rock outcrops. There are some minor occurrences of deeper soils in drainage channels but these are of very limited extent and cannot be utilized for cultivation. Generally, the land has relatively flat terrain with slopes between 0 and 4% and lies is at an altitude of about 800m above sea level.

Water quality from the dams and reservoirs is variable. Dam water was found to be highly contaminated with coliforms and as such not suitable for human consumption. Water from the reservoirs was found to be marginal, which is conditionally acceptable and may lead to occurrence of negative effects in some sensitive people, such as babies and the aged. Users of such water need to be urged to boil it before drinking.

The average family size of farm workers is 5, with at least 69.4% of the members in each household falling in the active population group. The ages of the heads of

households range from 24 to 65 years, with an average of 48. The major source of income is salaries and wages, followed by agriculture and government grants. Groceries take the biggest chunk of total household expenditure, followed by furniture and clothing.

Respondents practice agriculture by keeping a range of livestock which includes; chickens, cattle, goats and pigs, from which they get food and money from sales of these animals and their products. Farm workers also produce various crops, used for home consumption, from home gardens.

None of the respondents has ever owned land, and all would be pleased to own land on which they could produce agricultural products to improve their livelihoods. There are very few projects existing in the area, therefore the respondents would urge the authorities to assist them in starting income generating projects like pig and poultry production, sewing and vegetable gardens.

The farm management plan for this farm is based on a 500 ha grazing land. Although the farm has the potential for beef cattle and sheep production, sheep production was left out because of the high levels of small-stock theft, which in fact, led farmers in the area to abandon sheep farming. As such no plan was made for sheep farming. The gross margin analysis for the beef cow activity is positive. Again on the basis of the R9600 poverty line income per 5-member family, the farm can accommodate at most 5 farm households. When the number of farm household members exceeds 5 the share of income per farm household drastically drops and becomes below the poverty line income.

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- Mr Ayanda Gqezengele, for his assistance in obtaining the updated list of beneficiaries in Bedford.
- The farmers at the various farms for letting the team interview the farm workers.
- The farm workers, for their full cooperation during the socio-economic survey.
- Mr Bruce Joubert, of the Fort Hare Animal Traction Centre, for providing the information, which was used to draw the farm plan.

1. BACKGROUND TO THE STUDY

1.1 Introduction

The farm designated for use as the site for Bedford settlement project is located between the boundaries of the Bedford commonage, the Grahamstown Road (R350) and the remainder of Wortels Drift Farm, within the boundaries of the Nkonkobe Municipality in the Amatole District Municipality. The settlement area, which is 588 ha, is situated approximately 3 km from Bedford town, along the main road R63 from Fort Beaufort to Bedford.

Wortels Drift farm was purchased by the Amatole District Municipality, for the purpose of settling farm workers and provide for their livelihoods. About 224 households were listed on the beneficiary list that was drawn in 1998. On the 5th November 2001, the Amatole District Municipality appointed the Agricultural and Rural Development Research Institute, at the University of Fort Hare to conduct a feasibility study in terms of agricultural suitability and capability for the Bedford Settlement Project.

1.2 Terms of reference

ARDRI's terms of reference were to conduct a feasibility study of the Wortels Drift as follows:

Phase one

Phase 1A: Situation Analysis to cover

- Identification of boundaries of Wortels Drift farm
- A questionnaire survey to collect relevant information from 50 households
- Assessment of agricultural infrastructure, equipment and other resources
- Veld condition
- Soil survey & analysis

Phase 1B: Development plan (Draft)

- Give recommendations, based on the results of the study, which will determine the preferred course of action.

Phase 1C: Development plan (Final) & Implementation plans

- Give details of the plan and how the recommendations can be implemented

1.3 Deliverables

An acceptable plan of activities with time frames and budgetary requirements to be submitted to the Amatole District Municipality Offices in East London before commencement of the study.

A short preliminary report on the activities of Phase 1A to be submitted to the same address on or before the 15th January 2002, but later revised to 5th April 2002.

A report outlining recommendations and implementation plans to be submitted on or before the revised date of 30th April 2002.

A complete report of the study, including phases 1A-C, to be submitted to the same address on or before the revised date of 31st May 2002

1.4 Content of the report

This report presents findings and recommendations from the feasibility study, and implementation plans for the farm Wortels Drift.

2. EMPIRICAL INVESTIGATION

2.1 Methodology

2.1.1 Identification of boundaries of Wortels Drift

The team met with Mr Dixie of Havelock Holme, who helped in the identification of the settlement farm and its boundaries. By the time of the study, he was renting some of the land that has been identified for the project. Verification of the sketches was made with a 1:50 000 map of the area together with sketches from the land surveyor office.

2.1.2 Determination of agricultural infrastructure and equipment

Available infrastructure was identified at the same time as the identification of boundaries, with the help of Mr Dixie.

2.1.3 Rangelands appraisal

Due to the uniformity in the vegetation and the size of this unit, seven (7) vegetation surveys were conducted at seven sites. These sites were selected to cover the minor variations in terrain morphology and the noticeable patch-grazing pattern. At each site a 100-point quadrat survey was conducted. At each point the nearest rooted plant was recorded and the distance from the point to the tuft was estimated in centimetres. The data were analysed and interpreted using the Simplified Techniques for assessing veld condition (Trollope, Beckerling & Scogings, 1992).

2.1.4 Soil survey

A reconnaissance survey was carried out along three transects running east to west through one part of the farm and along three transects running north to south in another

part of the farm. Soil profiles were examined at some 23 positions in all, by making auger borings at 10 cm intervals down to the impervious layer or to ±110 cm where depth was non-limiting. At each borehole, diagnostic topsoil and subsoil horizons were identified and the soil classified according to the taxonomic system for South Africa (Soil Classification Working Group, 1991).

2.1.5 Collection of climatic data

Secondary information was obtained from the weather station 20187 Adelaide, PP, which collects data that is used for the district of Bedford, and some parts of Adelaide district. The station is located at Latitude -32.666 and Longitude 26.2833, with Agromet No 0077/490L at Altitude 600.

2.1.6 Determination of sources and quality of water

During the field trip the water sources on the farm were identified and water samples were analysed for the microbiological and physical characteristics.

2.1.7 Socio-economic survey

A socio-economic survey was conducted with farm labourers on the white owned commercial farms around Bedford (Appendix A). The objectives of the study were to collect basic quantitative information about livelihoods and farming related issues from the farm labourers. Respondents in this study are part of the beneficiaries to be settled in Wortels Drift.

Investigating the current socio-economic status of beneficiaries to Wortels Drift was done through a structured questionnaire. The survey was conducted during the period November 2001 to February 2002, with the aim of obtaining quantitative information on contemporary livelihoods of farm workers, targeted to be resettled on the farm. The basic unit of study and analysis in the survey was a household. For purposes of

the study, a household was defined as follows: for consumption purposes, a household consisted of members who usually slept under one shelter every night and shared the meals. For income purposes, members usually sleeping and eating elsewhere but contributing to the income of the household were added to the household defined for consumption purposes. Categories of variables covered by the survey included demographic composition of households, level of education of the household members, sources of income, expenditure patterns, and general agricultural information.

2.1.7.1 Selection of participants

A list of beneficiaries for each settlement was obtained from the respective municipal offices, from which the team selected respondents. The respondents were selected randomly and interviewed from their respective work places (farms). Ideally, the head of the household was the preferred respondent though in some cases spouses or even children of the household would be interviewed, where the head was not available. Also, where the head was too old to understand or recall some of the answers, other members of the household would be asked to assist. A total of 49 respondents were interviewed, which represents almost 12% of the households listed on the beneficiary list of Wortels Drift farm that was drawn in 1998.

2.1.7.2 List of Beneficiaries

Between 1998, when the initial list of beneficiaries wanting to move to Wortels Drift, was compiled, and the time when the study was conducted, many changes had occurred. The list had been updated, some of the people had passed away and others were no longer interested in moving. In addition, some households had registered members of their households separately, which resulted in the list being long.

3 RESULTS

3.1 Identification of boundaries of Wortels Drift

The sketch map developed from this exercise is presented in Appendix B.

3.2 Determination of infrastructure and mechanisation equipment

3.2.1 Farm buildings

There are no structures present on the farm.

3.2.2 Water dams

There are two dams in the earmarked area (Appendix C). Both are silted up thus reducing their water holding capacity.

3.2.3 Windmills and reservoir

There is one windmill, which is not functional, and one reservoir (Appendix C), with a capacity of 169 650 litres. The water reservoir is linked to several watering points for livestock and has water most of the year round. The tank is fed from underground water.

3.2.4 Access roads

The access roads within and around the farm are in good condition.

3.2.5 Dipping facilities

There are no dipping facilities in the section of Wortels Drift farm demarcated for the project. However, there is a facility on the boundary of the farm, which belongs to the neighbouring farmer.

3.2.6 Camps and fences

The farm is demarcated into about 5 camps with the camp fences in good condition and still intact (Appendix C). A greater part of the farm is covered by termitaries, which lower the quality of the farm to be classified into low class category in terms of land use classification purposes (Appendix C).

3.3 Rangelands Appraisal

3.3.1 The Veld Environment

Wortels Drift farm is located close to the town of Bedford in the veld type known as the *False Thornveld of the Eastern Cape* (Acocks, 1953). This is a sweet veld with a high animal production potential, which is also an inherent property of the Smaaldeel area.

It is relatively flat and uniform in respect of the terrain and vegetation, respectively. There are no trees or shrubs on the property and it is all open grassland indicating a potential for grazing animals with the exclusion of browsers like goats. Visually the farm is in good condition, in respect of its botanical composition and basal cover indicating a fairly good forage production potential and resistance to soil erosion. The farm is divided into 5 fairly small camps with fences and gates still in good condition. The subdivision is said to having been put in place to improve the efficiency of utilization of the grass, since patch (selective) grazing is very evident on the farm. On further investigation, it was noticed that this phenomenon is linked to soil depth with shallower soils probably producing highly acceptable grass while deeper soils produced less acceptable grass. As evidenced from the previous owner, who still uses

the land, and from the neighbouring farms the area has a high potential for beef production. High levels of theft could have contributed to the reduction of small stock farming in the area. One of the advantages of the sweetveld is that the quality of the forage remains fairly constant throughout the year and thus animals kept on such veld would require little if any supplementary feeding. In terms of beef production this means that animals will continue to gain mass, and therefore grow faster for quicker marketing or can be finished off the veld. The overall conclusion is that the farm has a good potential for beef farming, but unfortunately that potential will be seriously hindered by the size of the available grazing land.

3.3.2 Veld condition and grazing capacity

The results (Table 1) indicate that the veld condition of this farm is on average good with a grazing capacity of 5.7 ha/AU. The variations encountered in veld condition scores and their respective grazing capacities are a result of differences in benchmark sites that were used to compare each site. These benchmarks differ because the simplified technique uses sophisticated multi-variate analysis procedures, which define each site in relation to its habitat characteristics. This therefore brings about a realization that despite the seemingly uniform vegetation structure and terrain there are in fact very significant underlying factors, which may be responsible for the noticeable patch grazing. As mentioned earlier it did seem that soil depth was responsible for variations in the acceptability of the different areas within the farm.

Table 1. The condition of grass sward at Wortels Drift farm

Site	VCS (%)	GC (ha/AU)	Condition	Grazing Trend
1	73.8	4.0	Good	Correct
2	64.0	9.4	Fair	Slightly overgrazed
3	108.2	2.8	Excellent	Correct
4	54.0	11.0	Good	Slightly overgrazed
5	90.0	3.3	Excellent	Correct
6	81.0	4.0	Excellent	Correct
7	57.0	5.1	Fair	Slightly overgrazed
Mean	75.4	5.7		

3.4 Soil Survey

The results show that the farm has very low potential for arable agriculture. The whole farm is mainly covered by shallow soils with frequent rock outcrops. The majority of the soils classified as Glenrosas, Westleighs, and Mispahs, in that order, with some occurrences of Valsrivier and Swartland forms in drainage channels. The former three soils are of very limited depth, in the range 30 – 50 cm, while the latter two have deeper profiles due to deposition of materials from upper shoulders into the waterways. However, the deeper soils cannot be utilized for cultivation due to drainage problems.

Arable agriculture is not recommended on this farm. After some land has been set aside for residential purposes, the rest should only be used for grazing purposes but strictly with good veld management. It should further be noted that there is little or no surface water resources, and any agricultural productivity would be severely curtailed by the semi-arid climate.

3.5 Climatic data

Bedford district receives its highest rainfall in the summer months of October, November and December, with a maximum of close to 70 mm registered in December. On the other hand, the lowest rainfall is received in the winter months, with the lowest (15 mm) in June and August (Figure 1). The district also experiences the hottest days during summer months, with the hottest being February at an average temperature of 30°C. The coldest period in the district is during the month of July with an average of 5°C (Figure 2). On average, Bedford district experiences a maximum average of close to six days, in June, four days in May and 3 in July. However, the frost days occur in the months from April to August (Figure 3).

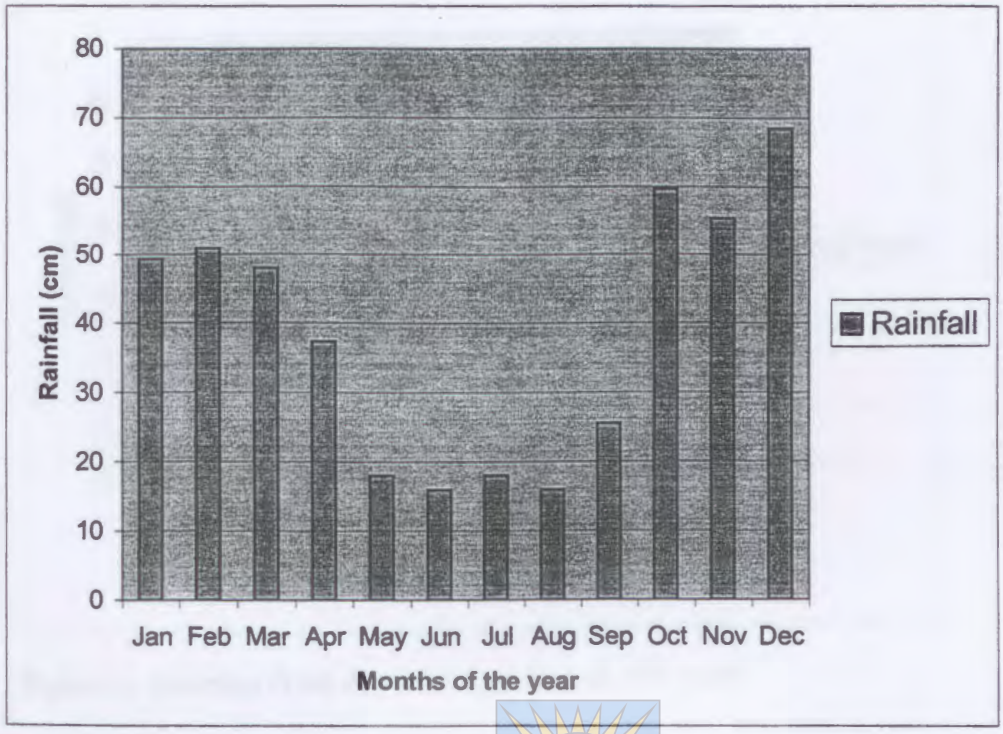

Figure 1. Average monthly rainfall for a period of 26 years

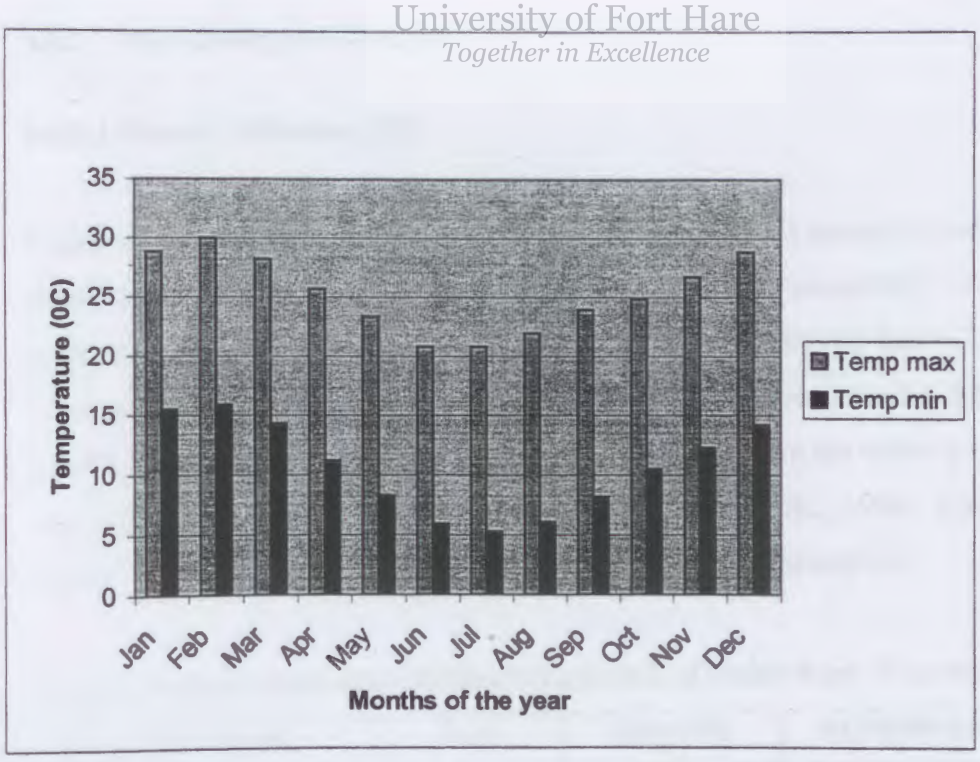

Figure 2. Average max and min temperatures for a period of 26 years

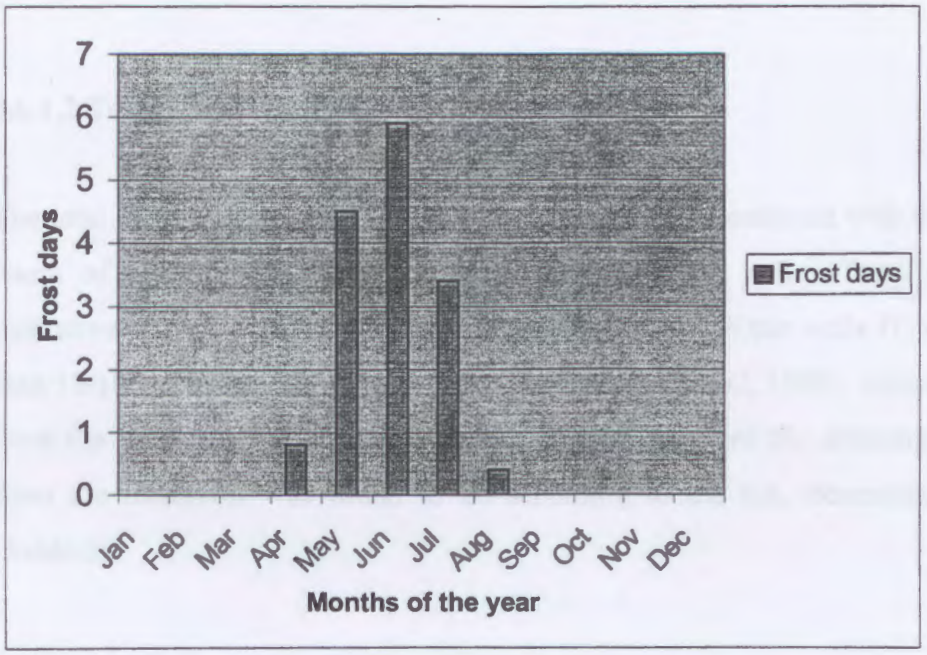

Figure 3. Average frost days for a period of 100 years

3.6 Water quality

3.6.1 Microbiological Analysis

3.6.1.1 Faecal Coliforms (FC)

Faecal coliforms are bacteria that indicate whether water is contaminated with faecal waste of human or animal origin. They are the most commonly used bacterial indicator of faecal pollution. Water from the Dam and Reservoir has FC counts of 3-13 organisms per 100ml (Table 2). According to the recommended South African standards for drinking water, counts between 1 and 10 mean the water is marginal and may cause some clinical infections in sensitive people (WRC, 1998). Counts from 10 upward are sure to cause infections, even with once-off consumption.

Table 2: Results from microbiological analysis of water from Wortels Drift

Colony (CFU/100ml)	Dam	Reservoir	SA recommended limits
FC	13	3	0
TC	15	0	10
HPC	117	109	100

3.6.1.2 Total Coliforms (TC)

The total coliform count indicates that the water is contaminated with both the faecal waste of human or animals and other bacteria from soil. Total coliforms are indicative of the general hygienic quality of the water. Water with TC counts of less than 10/100ml is regarded as good for domestic use (WRC, 1998). Although the water from the Dam was above the SA recommended standard for drinking water, water from the Reservoir was found to be according to the SA recommended standard (Table 2).

3.6.1.3 Heterotrophic plate count bacteria (HPC)

Water from both sample sites was found to be above the SA recommended limits for drinking water. The heterotrophic plate count (HPC or Standard Plate Count) is the internationally accepted test for measuring the bacterial population in water. The HPC test assesses only a fraction of the bacteria present and does not differentiate between pathogenic and non-pathogenic species. Therefore, HPC levels may not provide direct indication of potential public health consequences. High levels of microbial growth can affect the taste and odour of the water and may indicate the presence of nutrients (Table 2).

3.6.2 Physical analysis

3.6.2.1 Turbidity

Turbidity is caused by the presence of suspended solid matter. The solid matter usually consists of a mixture of inorganic matter, such as clay particles, and organic matter, which again usually consists of both detritus and living organisms. The presence of turbidity in water results in a cloudy or muddy appearance and may also affect the taste and colour of the water.

Table 3: Results from physical analysis of water samples from Wortels Drift

Parameter	Dam	Reservoir	SA recommended limits
pH	6.75	8.44	6 – 9
Turbidity (NTU)	10.1	1.03	0.1– 5

Water from the Dam has turbidity greater than the recommended limits, thus making it unfit for human consumption, while the Reservoir water was of acceptable levels (Table 3).

3.6.2.2 pH

Put simply, pH indicates whether water is sour (pH<7) or soapy (pH>7) to the taste. The recommended pH limits for South African water is 6 to 9 (Muyima & Ngcakani, 1998). The pH of the tested water samples was found to be within the SA recommended standards (Table 3).

3.6.3 Conclusions

As it has already been indicated, above, water quality for various uses differs. Water at the sampled sites is not fit for human consumption without treatment, such as boiling. According to the quality of Domestic Water Supplies assessment guide, such water can be classified as Class II (yellow). This means Marginal water quality i.e. it is conditionally acceptable and may lead to occurrence of negative effects in some sensitive people, such as babies and the aged.

The coliform group of bacteria is recognized as a microbial indicator of drinking water quality because these bacteria are commonly found in the environment, are present in large numbers in faeces, and are easily detected by simple laboratory methods. *E. coli*, a member of the coliform group, is found only in faecal material. The presence of coliform bacteria in a water system indicates vulnerability to contamination and ineffective disinfection., whereas the presence of *E. coli* or faecal coliforms indicates faecal pollution. People drinking water with these bacteria are at increased risk of contracting a waterborne disease.

3.7 Socio economic survey

3.7.1 Demography

3.7.1.1 Heads of households

The average family size of households of farm workers is 5, ranging from 1 to 12 members per household (Figure 4). At least 69.4% of the members in each household are in the active population group (i.e. between 15 and 64 years old), ranging from 1 to 10 members per household.

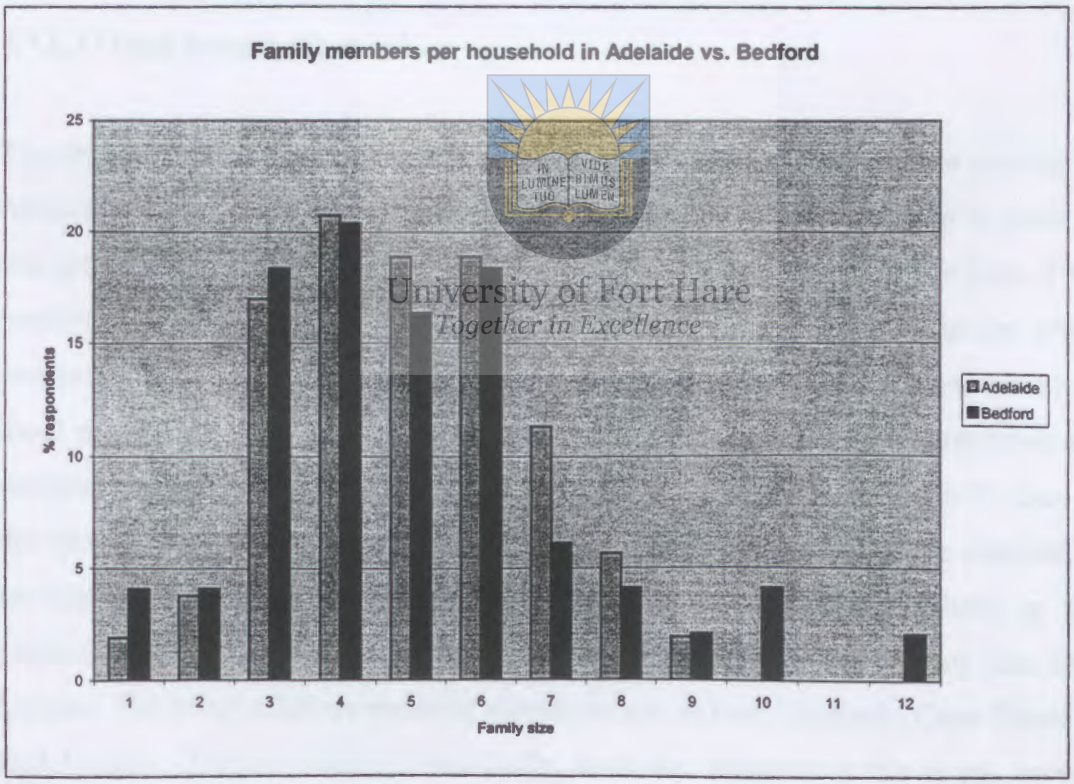

Figure 4. Average household family size

Males head most (81.6%) of the households sampled. The ages of the heads range from 24 to 65 years, with an average of 48 (Table 4). Most heads (71%) of households are married, 18% are single, 8% are widowed and 2% are living together. About a third of the heads have never gone to school, while the number of years spent at school by the rest ranges between 1 and 12. More than three quarters (82%) of the

heads are employed fulltime at the various farms, 8% are on part-time jobs, 6% are unemployed and 4% receive old-age pension. Of those that are employed, 78% are labourers, 11% are maids in the farmhouses, 9% are drivers and 2% are cashiers/salespeople.

Table 4: Age distribution of household heads in Bedford

Age group (years)	No of respondents	% Respondents
25-44	20	40.8
45-64	26	53.1
65	3	6.1

3.7.1.2 Other household members

The dependency ratio (number of children and the aged divided by the number of economically active people) is 0.54, ranging from 0 to 3. The proportion of children and grandchildren to the other household members is high (74%). The rest of the population is spouses and parents. About a third of the members are in the active population category but are unemployed, meaning that they are fully dependent on those members of the household who are employed. Most of the unemployed are women and young people who left school, some just after passing Grade 7. One of the reasons for these young people who are not attending school is the absence of secondary schools in their communities. Most have to attend school in the neighbouring towns or cities such as Adelaide, Bedford, Fort Beaufort and East London. The other relatives working elsewhere are in Port Elizabeth, Cape Town or East London. Those working in the study areas are labourers at the farms, mostly wives of the household heads working as maids in the farmhouses.

3.7.2 Sources of household income

Income distribution patterns play a pivotal role in evaluating or determining the living standards of households in any community. Analysis of the sources of household

income (Table 5) in Bedford shows that, the majority of respondents (93.8%) earn salaries and wages. The weighted average of salaries and wages is R6 190 with a range of 700 and 13 800. Agriculture and government grants (in that order) are the next most important sources of income. Majority of respondents derive some income from agricultural products with an average of R 795.91. Fewer respondents receive old age pensions (20.4%), and disability grants (6.1%). The number of respondents engaged in local trade (6.1%) as a source of income is very low and none of the respondents receive private pensions.

Table 5: Sources of annual income per household in Bedford

EXTERNAL	Average	Range	Respondents (%)
Salaries and wages	6190	700-13 800	93.8
Remittances (cash)	2288.89	500-7 200	18.3
Remittances (kind)	855.56	100-3 600	18.3
Child maintenance	1683.33	250-3 600	6.1
Pensions (old age)	7524	6 840-13 680	20.4
Disability grant	4840	1 200-6 840	6.1
Child support grant	1320	1 320	2.0
LOCAL			
Buying and selling	1020	360-1 800	6.1
Agriculture (livestock cash)	1928.88	250-3 820	38.7
Agriculture (livestock kind)	2764.33	18-28 800	30.6
Agriculture (crop kind)	187.52	21-680	42.8
Agricultural products	795.91	0-28 800	100

Remittances play a minor role in the livelihoods of farm workers; for example, only 18.3% of them receive remittances both in cash and kind.

3.7.2.1 Salaries and wages

Salaries and wages form the biggest component of the total household income. The distribution of salaries and wages are shown in Table 6. Very few (6.1%) of the respondents do not earn any income from salaries and wages. Income levels range between R0 and R13 800. Out of the total sample, 2% earn less than R1 000, the

majority (66.9%) are found in the R2 000 and R8 000 income bracket, 16.2% earn between R8 001 and R12 000 with a further 2% earning above R12 000.

Table 6: Distribution of salaries and wages per income category in Bedford

INCOME RANGES	NUMBER OF SAMPLE (%)
NIL	3 (6.1%)
LESS THAN R1 000	1 (2.0%)
1 000 – 2 000	2 (4.0%)
2 001 – 3 000	3 (6.1%)
3 001 – 4 000	4 (8.0%)
4 001 – 5 000	8 (16.3%)
5 001- 6 000	9 (18.3%)
6 001 – 7 000	4 (4.0%)
7 001 - 8 000	5 (10.2%)
8 001 - 9 000	1 (2.0%)
9 001 – 10 000	2 (2.0%)
10 001 –11 000	3 (6.1%)
11 001 – 12 000	3 (6.1%)
13 001 – 14 000	1 (2.0%)
TOTAL	**49 (100%)**

3.7.3 Expenditure

The annual expenditure patterns per expenditure category are reflected in Table 7. Groceries (food and other) take the biggest proportion of total household expenditure. On the average, all respondents spend R 2 659 on food with a range of R 1 200 and R 9 000 a year. A further 85.7% of the respondents spend an average of R 642.86 on other groceries ranging between R 0.0 and R 2 400 annually. Furniture and clothing are the next largest expenditure categories. More than 59% of the respondents use an average of R 2 292.28 on furniture while close to 96% spends on the average R 703.72 on clothing. Though a greater number of the respondents (63.2%) incur agricultural expenses, the yearly average of R 104.35 is low.

Table 7: Household Expenditure Per Annum

CATEGORY	Average	Range	Respondents (%)
Groceries (food)	2659	1200-9000	100
Groceries (other)	642.86	0-2400	85.7
Fuel	399.10	48-1200	63.2
Education	794.97	67-4000	71.4
Clothing	703.72	100-2575	95.9
Furniture	2 292.28	182-7200	59.2
Medical expenses	305.10	50-1020	61.2
Transport costs	647.61	100-3600	63.2
Housing rates and rentals	222.25	84-360	8.2
Expenses on house	357.41	15-8760	65.3
Maintenance (fences etc)	70	30-110	4.1
Telephone and postage	383.85	100-1440	26.5
Subscription and membership	576	5-120	10.2
Church contributions	349.19	36-3600	95.9
Entertainment (tobacco/liquor)	533.83	48-1200	83.6
Interest on loans	400	120-720	6.1
Hiring of labour	312	312	2.0
Agricultural expenses	104.35	0-1200	63.2
Savings	1 285.33	0-6840	30.6
Policy/Insurance	136.50	0-456	16.3
Burial clubs	365.35	0-1080	44.8
Mgalelo	398.18	0-120	22.4

3.7.4 Livestock and crops

3.7.4.1 Livestock

The species kept by farm labourers in Bedford farms are shown in Table 8. The majority of the respondents keep mostly chickens (33%), cattle (29%), goats (20%) and pigs (10%).

Table 8: Average livestock numbers

Species	Mean	Range	Respondents
Cattle	3	1-6	14
Goats	4	1-10	10
Pigs	1	1-2	5
Chickens	10	2-20	16

According to the survey, the farm owners allow their employees to keep livestock in their farms, though there are restrictions to the number each household can keep due to land size and tenure. Livestock of all the respondents camp with those of the farm owner under a rotational grazing system. Also dipping and other health management issues are tackled for the entire cattle and goat population at the farm. The livestock of the respondents drink water mainly from dams and few from boreholes and streams. The respondents keep their livestock to derive some money from livestock sales and for home consumption. Though the farmers assist in selling of their workers' stock, the workers also sell to various customers directly. Auctions are highly favoured and it is here that 53% of respondents sold cattle and 38% of them sold goats. Other outlets include neighbours and relatives (where 50% sell their pigs) and buyers from other places (where 50% sell their chickens).

Respondents also get other products from their animals, such as milk, meat and eggs. These products are mainly for home consumption, though sometimes they give away some, especially milk because it tends to spoil very easily. They make *amasi* and also feed some to their pigs.

3.7.4.2 Vegetable Gardens

Not many respondents (45%) have home gardens. Those with one, have a garden with an average of 217m^2 , but with sizes ranging from 6 to 2500m^2. The respondents (52%) had planted crops during the 2001/2002 season. Most respondents (46 %) depend on rainwater to water their gardens.

Respondents grow between 1-10 crops per respondent (Table 9). Potatoes are the most commonly grown (65%) followed by beetroot (58%), maize and pumpkin (41% each) and cabbage (35%). The crops grown are used mainly for home consumption.

Table 9: Average crop yields (kg) from home gardens

Crop	Maize	Potato	Pumpkin	Cabbage	Beans	Onion	Spinach	Beetroot	Carrot
Mean	44.3	39.5	9.4	20.1	7.5	9.2	6.2	12.3	16.6
Range	5-100	10-100	3-20	3-70	5-10	5-12	1-10	3-50	2-100
Producers	7	11	7	7	2	4	6	10	9

3.7.5 Land issues

Most of the people interviewed (82%) were born in white farms, 16% in black rural areas and only 2% born in townships next to cities. These people never had their own land and will be pleased to own land. They believe that the government should get and pay for that land, and 97% of them are prepared to move to wherever that land may be.

When the government is issuing land, the respondents feel that the first priority should be given to the poor, followed by those who wish to farm and third to people with farming skills as well as those who lost land before. At least 51% of the respondents in this area have experienced moving from one area to the other in search for work, 20% have moved because of low income and 17% because of bad relationship with the boss.

3.7.6 Community projects and infrastructure

It was found that there are very few projects existing in the area, therefore the residents feel there is a need for projects such as pig and poultry farming, sewing and vegetable gardens (Table 10).

Table 10: Needed community-based projects

Needed projects	No. of respondents
Poultry	2
Piggery	3
Cattle/Goat/Sheep	13
Wool sorting	8
Sewing	6
Abattoir	1
Vegetables	4
Sewing and Poultry	2
Poultry and Piggery	13
Sewing and Piggery	2

Currently accessible infrastructure includes water taps, electricity, primary schools and sports grounds (Table 11). There seems to be a big need for the availability of transport, clinics, electricity, telephones and community halls.

Table 11: Accessible infrastructure

Infrastructure	% Respondents
Transport	35.9
Telephones	18.9
Electricity	41.5
Clinic	5.7
Water taps	47.2
Schools	35.8
Community Halls	1.9
Playing grounds	24.5

The relationship between the people and their bosses is good. Individuals have a good relationship with each other and they expect the same even after they are moved to the 'new' place. The respondents are willing to move to another place that will belong to them because 53% of them think that a move will give them an opportunity to take agriculture as a business on their own. There is a general feeling among the people

that the efforts made by the government on land reform are enough and they don't foresee any land invasion because of strict laws in South Africa.

3.7.7 HIV/AIDS

All respondents are aware of HIV/AIDS with the most common source of information being the radio, followed by the television, clinics, town hall campaigns and from other community members (Figure 5). There are few people known of being infected with HIV/AIDS and also there are few people known to have died because of this disease. Those few who died did so between 2000 and 2002. Respondents in the survey communities are prepared to treat AIDS victim as they would a normal patient, though there are few that are saying they will chase him/her because they are afraid of being infected.

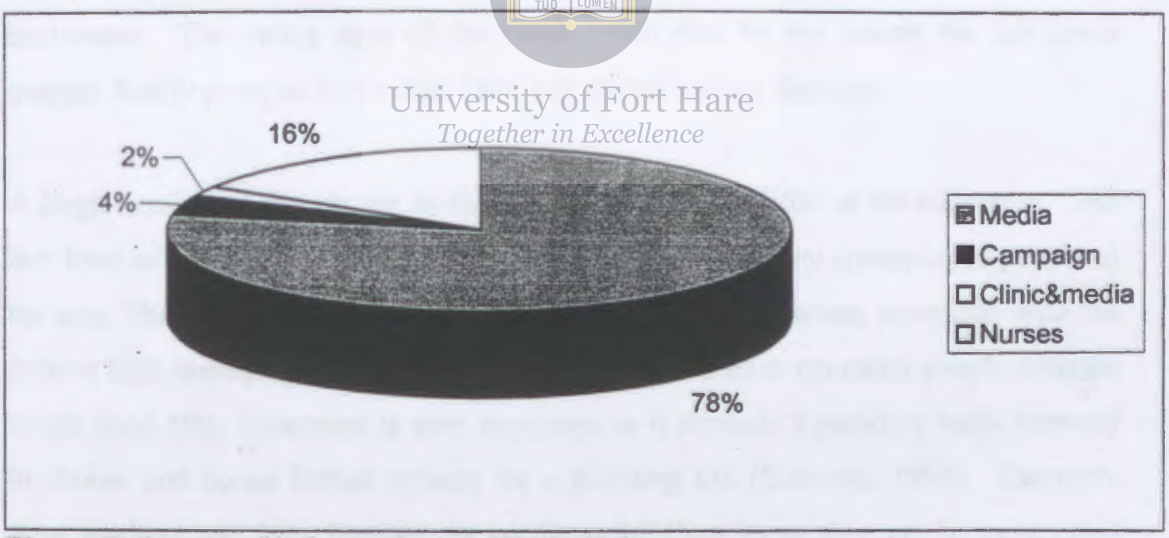

Figure 5: Source of information on HIV/AIDS

Almost three quarters of the respondents (73%) see the use of condoms as the best method that can be used to control the spread of the disease. Other preventative measures include sticking to one partner, provision of medicine by the government, abstention, awareness campaigns and good sexual behaviour. According to the respondents, efforts done to fight HIV/AIDS are not enough because at present there is no cure and more people are dying everyday. Most people believe that the development of medicine to cure AIDS will be the best effort to fight this horror

3.7.8 Discussion

From Fig 4, most households have 3 to 6 members, with the overall average of five members per household. This average family size of 5 is a little bit less than what has been observed in other studies (Fabricius & McWilliams, 1991; Van Averbeke et. al, 1998). This could be due to the fact that the current study dealt with farm workers, rather than regular community people. The houses they stay in belong to the farm owners and are in most cases not big enough to cater for large families and expansion of the houses without the owner's permission is not allowed.

Only 6% of the household heads are more than 65 years of age (Table 4). This means the people in the area are relatively young and thus will have no labour problems when they move to the settlement area. They will therefore be able to carry out their plans of changing their lives for the better, through farming and other small businesses. The young ages of the heads could also be the reason for the lower average family sizes, as they might have just started having families.

A large number of the people in the various farms have little or no education. This low level of education is one major reason why there are many unemployed people in the area. They find it very difficult to find a job in the urban areas, especially with the current high unemployment rate in this country, where even educated people struggle to get good jobs. Education is very important as it expands a person's basic capacity to choose and opens further options for a fulfilling life (Erasmus, 1998). Currently farm workers and their families do not have fulfilling lives; they are in most cases poor and do not have any land rights. Poverty can be defined as a lack of resources to meet basic needs such as food, clothing, shelter and basic amenities. It is more than a lack of income, as it involves inadequate access to services and poor prospects of employment. Access to social and economic services enables people to participate fully in the economy and the community. Education and training satisfy a basic human need for knowledge and skills and thus influence the welfare of any community.

The target group lives in white farming area, this offers them the job opportunities as farm hands and in return receive income. Most of the respondents receive salaries and wages, as a result reliance on remittances is not prominent as shown to be the case in other areas of the province. Fabricius and McWilliams (1991) and other studies confirm that rural dwellers are financially reliant on migrant workers. The situation in Bedford is a deviation from the norm that rural dwellers depend on migrant workers. Pensions as source of income are also relatively less prominent. This is also the opposite of the findings by Monde *et al* (1997), Ainslie and Ntshona (1997) and Van Averbeke *et al* (1998b) that claims against the state had become the main source of rural income, contributing about 50% of overall cash income among surveyed households in the Eastern Cape.

The mean annual expenditure in Bedford is R8 616. The overall mean monthly expenditure for the target group in Bedford is R718 and mean household size 5. Using the national household poverty line based on consumption expenditure at R 800 or less per month – 1996 prices, as yardstick, it appears all the respondents in the study group are below the poverty line. According to Wefa (1999), more persons (about 67% of persons) in the Amatole municipality live in poverty compared to 63.7% in the whole of the Eastern Cape, using the poverty line based on consumption expenditure at R 800 or less per month (Table 12).

Table 12: Persons in poverty in the Eastern Cape province

District Municipality	Persons in poverty (#)	Persons in poverty (%)
Western	269 913	47.1
Amatole DC	1 064 373	65.7
Chris Hani	613 789	68.5
Ukhahlamba	244 479	65.6
OR Tambo	1 300 618	75.0
Alfred Nzo	419 143	75.2
Nelson Mandela Metro	303 061	35.4
Eastern Cape	4 234 867	63.7

Source: Wefa (1999)

Majority of the workers do not belong to any private pension schemes, which implies that, they would have nothing to fall back on at retirement age. In the foreseeable

future, most of them are very likely to join the government's welfare grant scheme that is already financially overstretched.

Apart from providing their services mainly as farmhands, involvements in other areas as avenues for jobs are very few. For example, local trade as job provider is virtually non-existent. This trend could be attributed to among others, lack of abilities to venture into such trades, the remoteness of the study area and the tendency of rural dwellers buying all basics especially food from the towns and cities.

Salaries and wages generally fall in the low-income bracket. This confirms the trend of lower earnings in the Amatole District Municipality and the Eastern Cape at large. Wefa (1999) estimates that, 48% of the economically active in the municipality earn between R 0 – 6 000 (Table 13).

Table 13: A comparison of household income ranges in the District Municipalities and Eastern Cape

District Municipality	INCOME RANGES			
	R 0 – 6 000	R6 001 – 18 000	R 18 001– 42 000	R 42 000 +
Amatole DC	175 079 (48%)	80 537 (22%)	37 335 (10%)	37 534 (10%)
Alfred Nzo	200 (50%)	112 (28%)	44 (11%)	43 (11%)
Chris Hani	98 048 (62%)	37 832 (24%)	13 261 (8%)	10 370 (7%)
OR Tambo	160 083 (44%)	95 690 (27%)	45 862 (13%)	58 116 (16%)
Ukhahlamba	38 242 (48%)	19 940 (25%)	9 630 (12%)	11 266 (14%)
Western	26 939 (31%)	22 273 (31%)	11 627 (16%)	11 689 (16%)
Nelson Mandela Metro	44 163 (17%)	82580 (31%)	42 810 (16%)	92 869 (35%)
Eastern Cape	542 754 (43%)	338 964 (27%)	160 569 (13%)	221 887 (17%)

Source: Wefa (1999)

According to Central Statistical Services (CSS 1998) this trend is attributable to the fact that a high percentage of those employed in the Eastern Cape are found in the lower level occupations, which includes farm labourers, which form the bulk of our target group.

Majority of the respondents spend their earnings on consumables and furniture. This trend is an indication that almost all income is spent outside the study area or in the urban towns and cities. The outward capital flow does not help growth and development of the economy in the rural areas. According to several socio-economic studies by ARDRI in the region, the high proportion of income spent on especially food is an indication that agriculture is not coping in providing food to meet household needs.

Although agriculture is a major source of income, agricultural expenses are very low. This indicates that, they do not plough back some of their earnings into agriculture though income from agriculture is quite substantial. This does not augur well for the future improvements and expansion of agriculture.

The information gathered from the survey shows that many people who are staying or working in the farms do not have land. In many farms in the Cape, the bigger portion of the land (85%) belongs to the owner of the farm with the remaining small portion of land being rented by the workers (Antrobus et al, 1994). Even though some are not planning to leave their places of employment yet, the people feel that having their own land will give them freedom to farm as they please. Which will then improve their livelihoods and give more hope for a brighter future for their kids. The farm workers earn very low income that makes it difficult for them to survive, especially when it's their major source of income. They need to be assisted with community-based projects such as vegetable gardens, poultry, piggery or sewing.
The infrastructure in their places needs to be improved, for example in most of the farms people rely on mobile clinics for health related issues. The schools are far from the residential area and the children have to walk long distances. Such a leaner reaches the school already tired, ultimately will also perform poorly in class.

In designing of the infrastructure-related services such as electricity and water the people should be consulted to avoid cut-offs due to non-payment because people are earning low income (DBSA, 1998).

AIDS spread so rapidly in South Africa such that South Africa has experienced one of the fastest growth rates of the epidemic in the world (Whiteside and Sunter, 2000).

It is quite impressive to see that most people in the communities are aware of HIV/AIDS because it has the potential to have a devastating effect on social, economic and above all human development. According to the results, the awareness is through radio and TV programs, clinics and campaigns. According to McKenzie (1991) because AIDS is a social transmitted and socially preventable disease, the best way to contain it is probably not through health department flyers, TV messages or doctor's entreaties, but through changing the pattern of interaction within communities. Changing community behaviour also requires changing attitudes, values and power structures.

Outreach alone cannot prevent AIDS that is why health departments advise people to use condoms but according to McKenzie (1991) community norms for both men and women are not supportive of condom use. Condoms are free and in adequate supply but if adequate education is lacking their use is neither safe nor effective. More so powerless women are suffering the consequences because they become confronted with male sexual demands. Therefore effective use of condoms will require three components: greater availability, knowledge on how to use them and the urge to use them. This can be done through community intervention (David, 1996)

In conclusion, it is very important for the people to be cautious about this disease. Especially so, the young people who when informed of their HIV status the more they become reckless in their sexual forays as they compensate for not having long to live. It is encouraged that studies of this nature be continuous to reach larger parts of the society, which will help to know the shortfalls for making people aware of this scary killer in our country.

4. RECOMMENDATIONS

The area of about 588 ha is fairly small for a combined residential and farming proposition, especially considering that visually and generally the area is suitable for livestock production, which generally requires more land than cropping. Nonetheless, it is worth noting that in Bedford there is a grazing commonage, which visually looks comparatively similar to the area under consideration. Of interest was the fact that the condition of the veld is still fairly good, a scenario commonly unexpected for a communally grazed sweetveld. Even for the proposed development it is possible that while providing for residential purposes one can also cater for a small grazing commonage for those residents, although that will clearly require strict control measures to minimise the risk of accelerating veld degradation.

4.1 Livestock production systems

As mentioned earlier indications from an appraisal of the area are that the area is largely used for beef production. With this understanding a beef production system is proposed. Due to the absence of the woody vegetation goats are not recommended.

With regards to beef farming there are a number of production systems that one can consider with each system having its merits and disadvantages. These systems include the following: -

(a) Breeding and selling weaners (8 month old) and cull cows
(b) Breeding and selling older animals (between 1 – 3 years of age)
(c) Buying young stock (weaners) and fattening them off veld
(d) Feedlots

Considering the supposedly communal nature of the livestock farming to be undertaken by the beneficiaries on these farms, options (a) and (b) seem to be the most logical. These options will allow individuals to run separate herds thus permitting them to choose the option that best fits their individual objectives or needs. Option (c) could be another viable option but would require a communally agreed upon system as this system, if practiced by individuals, could be easily interpreted as

exploitation of a common resource by those individuals while the costs of such exploitation will be shared by all. Option (d) is out of question due to the supposed communal nature of the future land use and the low potential for crop production. Assuming a calving percentage of 70 % as a minimum acceptable rate the livestock composition for the first two system will be outlined and used as a recommendation.

4.1.1 Breeding and selling weaners and cull cows

Assumed: 70 % calving percentage

Assumed grazing area: 500 ha

Number of breeding cows: The breeding stock is the main important component of an enterprise of this nature; therefore the number of cows determines the size of the herd. In respect of dry matter requirements per year such a system translates to 158 AU (Jones, Arnot & Klug, 1989), which per 100 cows is an equivalent of 1.58 AU/cow.

For 500 ha at a grazing capacity of 5.7 ha/AU the number of AU is 88

At 88 AU the number of cows will therefore be = 88 AU/ 1.58 AU/cow = 55 cows

Thus, option (a) would require a total of 55 breeding cows.

This figure takes into account the recommended grazing capacity and caters for calves, bulls and other non-breeding animals expected in such a system within the recommendation.

At a recommended rate of about one bull per 25 cows, the above system will require 2 bulls. The profitability of the above system is very much dependent on the calving rate, and the suggested 70 % means that each cow will calve at least 2 times for every 3 years. With the recommended 243 cows one would expect at least 38 calves each year.

With a 20 % replacement rate, 11 of the calves will be retained in the herd, while the same number of cull cows will be added to the stock to be sold. Therefore for this system at the recommended stocking rate, about 27 weaners and 11 cows could be sold annually. Generally, buyers prefer about 200 kg live mass for steers and 180 kg for heifers.

4.1.2 Breeding and selling older animals (12 – 36 months)

Assumed: 70 % calving percentage

Assumed grazing areas: 500 ha

Number of breeding cows: As mentioned before for these systems the breeding stock is the main important component such that the number of cows is the focal point in the determination of the size of the herd. In respect of dry matter requirements per year such a system translates to 247 AU (Jones, Arnot & Klug, 1989), which per 100 cows is an equivalent of 2.47 AU/cow. For 500 ha at a grazing capacity of 5.2 ha/AU the number of AU is 88. At 88 AU the number of cows will therefore be (88 AU/ 2.47 AU/cow) = 36 cows

Therefore for option (b) the number of breeding cows that can be kept is 36. This figure takes into account the recommended grazing capacity and caters for calves, bulls and other non-breeding animals expected in such a system within the recommendation.

At a recommended rate of about one bull per 25 cows, the above system will require 1 bull. With the recommended 25 cows one would expect at least 25 calves each year. With a 20 % replacement rate, 7 of the calves will be retained in the herd, while the same number of cull cows will be added to the stock to be sold. Therefore for this system at the recommended stocking rate, about 18 weaners and 7 cows could be sold annually.

As mentioned earlier each of the two systems has its merits and its disadvantages. Option (a) has a quicker turnover and has fewer age groups of animals. On the other hand animals sold at that age usually get a higher class and fetch a better price per kilogram. The calving percentage plays a vital role in these systems since cows that do not have a calf can be described as non-productive passengers. Considering the fact that buyers prefer animals in the 180 – 200 kg range, the breed and the size of weaners also play an important role. The disadvantage with the weaner system is that during a bad year the weaners will be smaller when sold and few cows will conceive resulting in a smaller calf crop the following year.

With the second system profitability is less dependent on achieving a high calving rate because all the available animals including "passenger cows" form part of the productive stock, as they are actually saleable animals. Despite the lower number of animals that will be sold annually they will be worth more because they will be larger.

Wortel's Drift is a very small farm bordering an urban area. Any new settlements should be incorporated into/ be an extension of the existing urban structure, since farming is not a viable option for any number of families. The rest of the land (not used for settlement) would become part of the commonage that is presently used as grazing by the township dwellers. Main source of income for settlers here would not be from farming but from employment elsewhere, though families may be able to keep a few head of livestock each.

5 FARM PLAN

5.1 Introduction

This farm is located close to the town of Bedford. This farm has a potential for beef cattle and sheep production. However, there is a very high level of small stock theft, which has made many farmers in the area to stop farming with sheep and goats. However, estimates for a sheep enterprise have been included in the farm plan. The farm has about 500 ha grazing area.

The main objective of the farm management plan in the context of this settlement farm is to determine the actual number of households that can be settled on the two farms. In determining the ideal number of households that can be settled on the farm, one has to have a criteria or a benchmark. For this exercise, the criterion we intend to use is the national household poverty line. The national household poverty line based on consumption expenditure of R800 per month per 5-member household is R9600 per annum (CSS and World Bank, 1999).

5.2 Assumptions

The gross margins of Wortels Drift farm were generated using the following assumptions:

1. It is assumed that the farm will practise animal management and breeding, selling weaners and culled cows
2. It is assumed 70 % of calving
3. It is assumed that there is 500 ha of grazing and
4. For 500 ha at grazing capacity of 5.7 ha/ all the numbers of all is 88
5. At 88 AU the number of cows will be equal to 88 AU/1.58 AU/cow =55. Thus the number of breeding beef cows that can be kept on the 500 ha of grazing area = 55 plus their followers
6. It is recommended that one bull is enough for cows. Thus, the farm needs 2 bulls.

7. With 70% calving rate, each cow will calve at least 2 times every 3 years. With the recommended 55 cows one would expect at least 38 calves each year.
8. With a 20 % replacement rate, 11 of the calves will be retained in the herd and the same number of cows will be culled and sold. Therefore the system will sell 27 weaners and 11 culled cows.
9. Generally buyers prefer about 200 kg live mass for steers and 180kg for heifers.

5.3 Gross margins

5.3.1 Gross margin for a self sustaining sheep with a flock of 100 ewes

Internal structural coefficients:

Ewe mortality rate = 0.05 (no. Of ewes survived = 95)
Lamb birth rate = 0.90 (no. Of lambs born, 45 males and 45 females)
Lamb mortality rate = 0.09 (no. Of lambs survived: 41 males, 41 females)
Rams: ewes = 0.05 (1 ram for 19 ewes)
Ewe and ram replacement rate = 0.20 (keep 7 + 0 replace ram and sell 40
(Keep 24 ewes and sell 17ewes)

Activity budget

Input costs:	**Rands**
Replacement of rams	(bred)
Replacement of ewes	(bred)
Feed (supplement)	8000.00
Veterinary	300.00
Marketing	2800.00
Total inputs costs	11.100.00

Output returns:	
Cull ewes (old ewes = 19) and sell	9000.00
Male lambs (40 of them) @R300/lamb	12000.00
Female lambs (17 of them) @ R350/ewe	5950.00
Wool	8000.00
Total returns	34950.00
Gross margin/100 ewes	**23850.00**
Gross margin/ewe	**238.50**

*The farm household will keep mutton type sheep. Thus, the income from sale of wool is small.

5.3.2 Gross margin analysis for a self-sustaining beef unit with a herd size of 55 beef cows

Internal Structural coefficients:

Calving rate = 0.70 (Calves born, 19 males and 20 females)

Bulls: Cow Ratio = 0.04 (1 bull for 25 cows)

Beef cow and bull replacement rate = 0.20 (keep 2 male calves replace and sell 17
(keep 9 females and sell 11 females)

Activity budget

Input Costs:	**Rands**
Replacement of bulls	(bred)
Replacement of old cows	(bred)
Feed (supplement)	3 500.00
Veterinary	1 000.00
Marketing Costs	750.00
Total Input costs	5 250.00

Output Returns	
Cull Old cows (11 of them) and sell @ R1 500	16 500.00
Male Calves (17 of them) and sell @ R2 000	34 000.00
Female Calves (11 of them) and sell @ R 2 500	27 500.00
Total Returns	78 000.00
Gross Margin/ 55 Beef Cow	**72 750.00**
Gross Margin/Beef Cow	**13 22.72**

5.3.3 Determination no of households

This farm has 500 ha of grazing area, all suitable for beef cow production. The potential of sheep production is low because of the high levels of stock theft in the area. The socio economic survey of the area indicated that a 5-member household requires R9600.00 per annum to subsist. This figure fairly corresponds with the national household poverty line. Using this poverty line and the gross margin for beef cow activity, the following scenarios are generated.

5.3.3.1 Scenario 1 (5 households are settled on the farm)

Suppose 5 households are settled on the farm and each household will have equal access to the 500 ha grazing land. The maximum number of beef cows that can be kept on the farm is 55. The total gross margin that can be derived from the 55 beef cows per year is R72750.00. This implies that each farm household can keep about 11 beef cows to realise the income of R14542 (11*1322.72).

5.3.3.2 Scenario 3 (8 households are settled on the farm)

This scenario implies that each farm household can keep a maximum of 6.875 beef cows on the farm and realise a yearly income of R9093.70, which is slightly lower than the amount for the poverty line.

5.3.3.3 Scenario 2 (10 households are settled on the farm)

This scenario implies that each farm household can keep a maximum of 5.5 beef cows on the farm. This scenario will leave each farm household with a yearly income of R7274.96. This income is less by R2325 from that of the income for the poverty line.

6 ACTION PROGRAMME

Based on findings of the survey, the following action plan is suggested. This plan is flexible and is subject to change depending on prevailing market and other conditions.

3 year operational plan

YEAR	ACTIVITY
1	Repair fences according to homogenous vegetation units, apply grazing management for recovery of camps
2	Clearing dams and repair of windmills
3	Repair roads, firebreaks and putting in other structures

6.1 Capital expenditure plan

1. Repair of farm fences including camp fences
   (± 50 kilometres @ ± R30.00 / kilometre) = R 1 500

2. Clearing of dams (2*R 1 500), repairs to
   Windmills (1 * R 20 000) = R 25 000

3. Repair access roads (within and around farm
   ± 50 kilometres @ R 300 / km) = R 15 000

4. Repair firebreaks (within and around)
   (± 50 kilometres @ R 3 km/day * 17 days * R 60.00) = R 3 000

4. Provision of buildings farm buildings and other structures = R 500 000

6. Livestock – (55 Beef cattle @ R 2 500 each) = R137 500

7. Livestock – (100 Sheep @ R400 each) = R 40 000

TOTAL [1] **= R 722 000**

6.2 *Annual operational cost per 8 households

Medication (55 beef cows @ R 150.00 per animal per year)	= R 8 250
Supplementary feeding (55 beef cows @ R 10.00 per animal per 4 months of the year)	= R 2 200
TOTAL [2]	**= R 10 450**
GRAND TOTAL (1+2)	**= R732 450**

6.3 Three-year labour management programme

- Establish a farm management committee chosen by the community.
- Draw on existing expertise and experience within the farming community to train more farm hands.
- Acquire the services of a farm manager/s in the long term. The prospective manager/s should be experienced in the following:
    1. General management of livestock (including disease diagnosis and treatment)
    2. Human resource management
    3. Financial management
    4. Monitoring, coordination and evaluation of the general farm process
- The farm manager reports to the farm management committee.

Among others, the following should also be considered:

1. Mentoring of this farming community by the surrounding commercial farmers. A study group of farmers from farms neighbouring Mt Pleasant has already offered its services to assist with mentoring of the community to be settled on the farm.

2. Training in various production systems

7 REFERENCES

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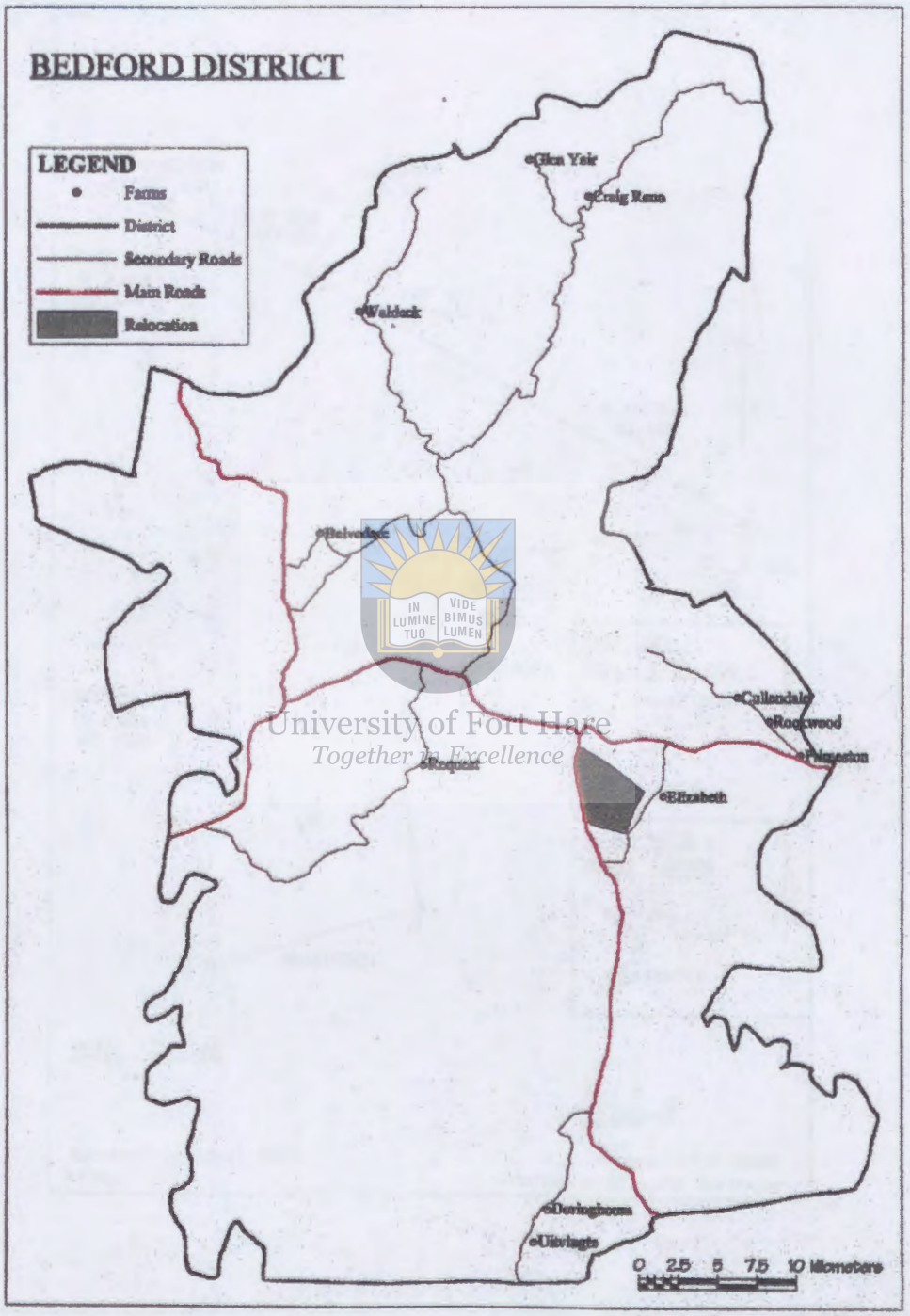
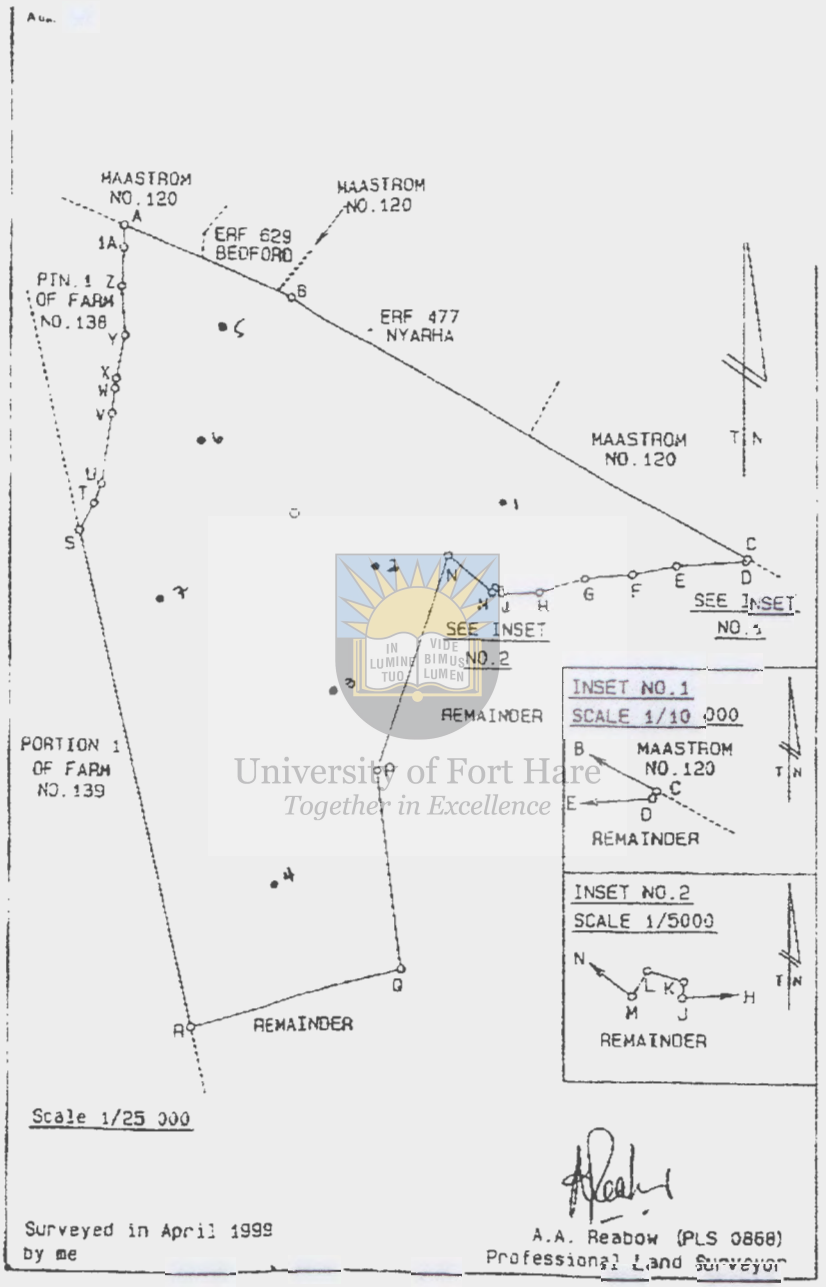
Appendix A Map of surveyed farms



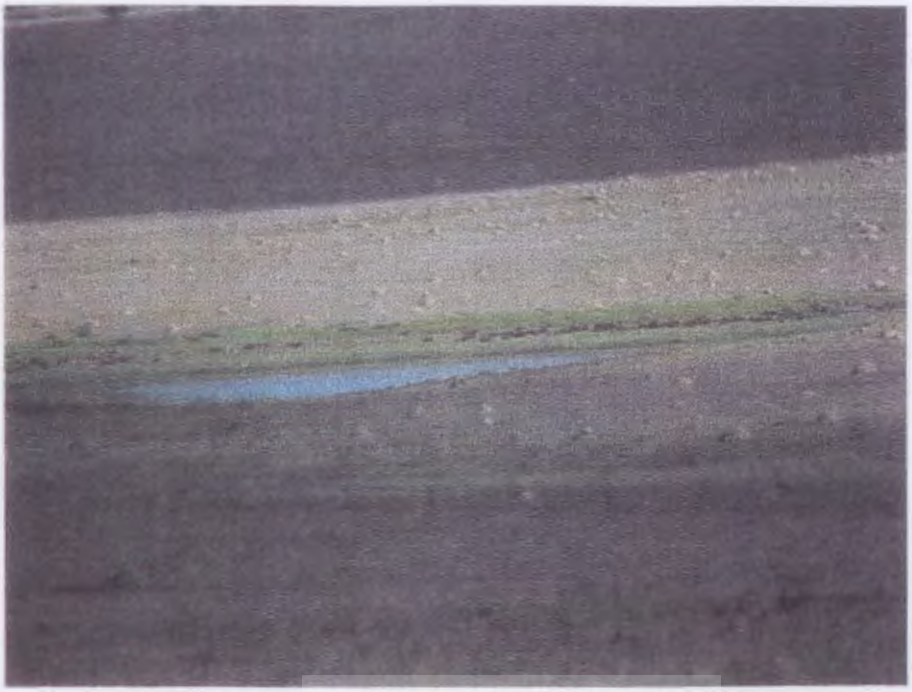
Appendix B Sketch map of Wortels drift farm



Appendix C

Picture 1: Reservoir and links to watering points

Picture 2: A watering point linked to the reservoir



Picture 3: A silted dam with very little water and termitaries in the bacground

Picture 4: A dam overgrown with reed plants – Bedford

Picture 5: Fence line intact – Bedford

Picture 6: Majority of land area is infested with termitaries (a close shot of a termitory)