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THE VIABILITY OF THE SOCIO-ECONOMIC SUSTAINABILITY OF UNDERDEVELOPED FARMERS IN THE DRIEFONTEIN AREA, NORTH WEST PROVINCE.

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Keywords: Sustainable, subsistence, small scale, underdeveloped, commercial.

ABSTRACT

Different arguments about the viability of underdeveloped farmers are going around. Many researchers and stakeholders were involved in projects aimed at improving the underdeveloped farmers' enterprises. Very few of the private or Government initiated projects paid any dividends to those involved. It appears that farmers lack the capability to incorporate the five components (biological viability, resources availability and viability, economic viability, social / community orientated viability and risk factors) necessary to manage a sustainable agribusiness. This study looks at present agricultural enterprises, the socio-economic components needed for a sustainable enterprise and how a sustainable enterprise should be managed by underdeveloped farmers. The study area was Driefontein which is situated in the north eastern part of the North West Province (25^{o}55' E: 25^{o}45' S). The average yearly rainfall over the period 2000 to 2007 was 325 mm. Of the 218 respondents 27% is involved in animal husbandry and 42% is involved in crop production. The remaining 31% is subsistence farmers and/or are involved within the farming community. The 218 farmers produce a total of 18 t of maize, 20 t sorghum and 7 t sunflower on a total of ± 660ha, which proves the situation to be unsustainable according to the five pillars criteria for sustainable agriculture. The three input parameters representing the highest expenditure levels are fuel (R3 216), seed (R1 794) and labour (R1 335). Given the income they obtained from their crop production it is evident that the profit (per farmer) was R63 (maize), R235 (sorghum) and R64 (sunflower) per production season, respectively. The farmers indicated that the main reason for crop losses is drought, and to a minor extent damage caused by birds, stray animals, theft, diseases and pests. Damage caused by incompetency and monoculture practises are not considered a risk. However, if the potential farmers (semi-commercial and share croppers) receive training regarding sustainable agriculture, they will become accustomed to the complicacy regarding managing a sustainable agribusiness and can develop the needed skills necessary to manage a sustainable agribusiness.

1. INTRODUCTION

Studies regarding the underdeveloped farmer's agricultural sector in South Africa are a discipline full of challenges for those who endeavour to improve this sector. It is clear that stagnancy and unsustainable agriculture situations are at present prevailing at Driefontein. The prevailing restrictions, e.g. climate and viable sustainable

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production systems, require innovative thinking in the quest for alternative production systems within the framework of extensive production systems. In the past various attempts were made in developing the underdeveloped farmers of Driefontein, but the results showed that very little progress had been made. The majority of role-players'' studies executed at Driefontein indicated that there are a number of obstacles to overcome, but few recommended achievable ways and means to address these problems.

The University of Pretoria did a survey which involved 177 farms in the Vryburg, Lichtenburg, Klerksdorp and Brits districts. Existing economical viable commercial enterprises were transformed through land reform to new entrants to agriculture to investigate their capabilities to sustain these running concerns, and whether they can manage commercial enterprises. The report indicated that 44% of these projects were close to collapsing and 27% did collapse. Thirty seven percent of the farmers, initially involved in the project, withdrew from the project due to problems they have experienced. More than 50% of the participants were general farm workers, 28% were underdeveloped farmers of which only 3% had some commercial farming experience (Farmer's Weekly, 9 Dec 2005).

Another government supported project nearby Hartbeesfontein was stopped after the Society for the Prevention of Cruelty to Animals (SPCA) had visited the project. According to Inspector Sibiza of the National Council of SPCA's (NSPCA) the animals were dying due to malnutrition. According to Inspector Sibiza it appears that this situation is nothing but the tip of the iceberg. There are sixteen other government projects of which the standard is average to bad, and the projects are deteriorating at a daily rate, so much so that they are on the brink of collapsing (Grain SA, 2004).

A number of projects collapsed when Bophuthatswana was incorporated into the Northwest Province after the 1994 elections. Research indicated that a decrease in agricultural activities was visible, especially in the dry land production areas (Dapaah *et al*., 2001; Armecin *et al*., 2002, quoted by Verschoor, 2002). According to Verschoor (2002) the development of other industrial sectors such as mining, construction, etc., cause many inhabitants of rural areas to migrate to areas where they can obtain a better income.

It appears that the production targets, developmental outcomes and aims of the role-players regarding Driefontein were not reached. A number of questions arise due to this phenomenon, e.g., "What caused the collapse of the projects? Why does production decrease when role-players withdraw? The remaining subsistence and underdeveloped farmers are still interested in farming, therefore innovative thinking is needed to develop them to a level where they can maintain a sustainable and socio-economical agricultural enterprise.

Farming systems

The only farming system which is easily distinguished from the rest is the commercial farming enterprises. There are numerous definitions to describe the systems from the non-commercial environment. Names like subsistence farmers, small scale farmers, emerging farmers, resource poor farmers, developing farmers or communal farmers are used.

There are mainly three categories into which underdeveloped farmers can be divided. The first group, subsistence farmers, are those who lack the necessary resources to implement a proper commercial production system, and cannot support their own families. Small scale farmers are described as farmers with small enterprises with no or little means to make use of applicable suppliers of farming materials. Emerging farmers are described as farmers with low output production systems, uncertain property rights, uneconomical farms, lack of support and they have restrictions to participate in agricultural markets (Lipton *et al.*, 1996).

The character of underdeveloped farmers does not agree with the applied autocratic perception of role-players in the agricultural sector. According to Verschoor (2002) there are four categories in which underdeveloped farmers can be classified. The classification was done by using the Principle Component Analysis. The half-commercial group (9% of Driefontein's farmers) can be perceived as successful. The next group, share croppers (35% of Driefontein's farmers) cultivate pieces of land by means of hiring implements and they have access to technology. This group, such as the half-commercial group, has the potential to accept the challenges to become commercial farmers. The opportunists (37% of Driefontein's farmers) are those whose agricultural activities depend and change according to available resources and opportunities within a specific production season, and their yields are low. The fourth group is the unproductive land-owners (19% of Driefontein's farmers). They practise subsistence production systems and use natural resources only to secure food for their families (Verschoor, 2002). Underdeveloped farmers struggle with factors beyond their control such as eroded lands due to drought, excessive rain, and/or support presented to more successful farmers. Underdeveloped farmers cannot keep up with High External Input Agriculture (HEIA), because they cannot afford it. They are forced to apply Low External Input Agriculture (LEIA) which usually involves more traditional methods. According to Mr. E. Abwino from the Kasisi Agricultural Training Centre an emerging farmer is categorised by the lack of financial and technical resources and not by the size of agricultural land (Johansson, 2002).

Hence, the primary focus should be a service delivery approach and recommendations and solutions towards establishing a sustainable commercial production system. Outcomes might suggest that different production systems should be applied.

2. SUITABILITY OF DRIEFONTEIN AS AGRICULTURAL AREA

Driefontein is situated in the north eastern part of the Northwest Province ($25^{o}55'$ E: $25^{o}45'$ S). The area has in general a flat surface with no hills or mountains. Studies executed in the Driefontein area, Ditsobotla district, indicated a farming community which consists of subsistence farmers, emerging farmers and commercial farmers (Bachtiar *et al.*, 2003). The two most important crops which are produced in Driefontein are maize with an average of 1400 $kg.ha^{-1}$ and sorghum with an average of 400 $kg.ha^{-1}$. No crop rotation practises are applied (Bachtiar *et al.*, 2003).

2.1 Rainfall

Rainfall in Driefontein is very erratic and the dispersion is uneven. During 2000 and 2007, the highest average rainfall was measured in the year 2000 and the lowest in 2005. The highest rainfall figures were recorded at Phora and Supingstad. The lowest rainfall was recorded at Dinokana. The average yearly rainfall over the period 2000 and 2007 was 325 mm.

2.2 Temperature

Maximum and minimum daily temperatures for the period 2000 to 2007 (Figure 2), as supplied by the South African Weather Buro (SAWB), indicate the extremes to which Driefontein is subjected. There are also big differences between the maximum daily average of 28.6ºC in summer, and the daily minimum of 1.3ºC in winter. The low winter temperatures cause low soil temperatures, and the low soil temperatures are not conducive to the start of the production season and also suppresses seed germination.

2.3 Water management at Driefontein

Drought statistics indicate that between 1920 and 1984 the worst droughts were experienced for a period of 22 out of 64 years. This gives an average of one out of three years (Van Niekerk & Du Pisani, 2006). The Driefontein area has an arid to semi-arid climate with erratic rainfall (250 mm – 550 mm). According to the SAWB, Driefontein lies within the Central Interior and receive the highest rainfall in January. Since 1920 the driest summers occurred during 1982 to 1984. The average rainfall of 325 mm per year is not sufficient for sustainable crop production, taking into account the evaporation level of between 1 600 to 1 800 mm per year (Barnard, 2000, quoted by Van Niekerk & Du Pisani, 2006). This gives an aridity index between 0.18 and 0.2. Driefontein, within the Baharutshe Heartland, is a tertiary area in the Krokodil Wes / Mariko catchment area with dominating alkaline water. Inhabitants of this area are dependent on water sources for household and agricultural purposes which are supplied by dolomitic fountains or boreholes. Many water supply initiatives collapsed because of the abnormal demand on the scarce underground resources (Sami & Murray, 1998, as quoted by Van Niekerk & Du Pisani, 2006). In an attempt to save water the government did not apply strict enough measurements, because they did not want to aggravate the traditional leaders (Allan, 2002, quoted by Van Niekerk & Du Pisani, 2006).

3. MATERIALS AND METHODS

3.1 General

The method used to obtain the data for this study was a quantitative theoretical approach, within the framework of Human Geography and Agriculture, supported by the socio – economic discipline of emerging farmers. To obtain primary data the quantitative approach falls within the genre of the Participating Rural Appraisal Approach, where farmers were interviewed in an informal manner by using a questionnaire and through informal discussions to investigate the present state of their affairs. The questionnaire was presented in Afrikaans, English and Tswana. The quantitative approach was used because a qualitative approach might not reflect the true situation, especially where human emotions are involved. Secondary data were obtained through discussions with institutions and role-players who were involved in agricultural projects in the Driefontein area. The sets of information were analysed, compared, and evaluated within the five pillars of sustainability (biological viability, resources availability and viability, economic viability, social / community orientated viability, risk factors) necessary to support a sustainable commercial production system. From the latter, only the socio-economic pillars are discussed to address the purpose of this study. Conclusions and recommendations will be directed towards a sustainable commercial production system, if however possible.

A total of 218 respondents were interviewed and they were free to air their true and honest opinions. The respondents were identified by the Extension officers of the North West Department of Agriculture. Relevant articles, internet, departmental reports, agricultural newspapers and magazines, and doctoral thesis were used to support the survey.

Similarities between international and national phenomena were used as barometer in an attempt to counter-act subjectivity regarding this specific survey.

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3.2 Resource data

A soil profile was compiled by using data from ARC-ISCW and by digging profile holes at Moshana and Rietpan. The analysis as shown in Table 1 was done by Mr E. Louw (North West Department of Agriculture).

Table 1: Soil analysis at Moshana and Rietpan (Louw, 2007)

Parameters	Moshana		Rietpan
	Sample F 1016	Sample F 1017	Sample F 1018
Soil depth mm	0 - 300	300 – 1500	0 - 800
pH (ACl)	5.5	5.3	5.1
P Bray 1	2	1	1
Conduction	17	23	36
K (NH4 Ac) mg/kg	155	90	213
Ca (NH4 Ac) mg/kg	216	352	4554
Mg (NH4 Ac) mg/kg	40	61	1041
Na (NH4 Ac) mg/kg	16	16	87
Texture	Sa	Sa	C L

The production potential of Moshana was determined by using the SWAMP-model (Bennie *et al*., 1998). Due to the high clay content at Rietpan another model, Determination of Yield Targets Chart (Mohr, 1972), had to be used to determine the production potential.
Soil samples were collected at a depth of 0 to 1500 mm. The Moshana sample (F1016 and F 1017) showed sandy soils with a clay content between 11% and 25%. Rietpan (F 1018) showed clay soils (> 55 % clay).
The pH of the soils measured 5.5. The phosphorous value (P Bray 1) at Moshana and Rietpan measured 2 and 1 mg.kg^{-1}, respectively. Potassium and magnesium levels were sufficient.

Table 2: Input parameters and values using SWAMP to simulate maize yields at Moshana (a) with Clovelly soils, and the input parameters and values using the Yield Targets Chart to simulate maize yields at Rietpan (b) with Arcadia soils

(a)

Inputs	
Parameters	**Value**
Soil depth (mm)	Water content (mm / mm)
0 - 300 300 - 600	0.11 0.12 0.13 0.13
Planting date	7 December
Growing season length	130 days

(b)

Inputs	
Parameters	**Value**
Soil depth (mm)	0 - 380 380 - 1500
Root depth (mm)	140
Planting date	7 December
Growing season length	130 days

Eon	5.2 mm / day
Different rainfall scenario's *	(mm)
Below average Average Above average	166 286 590

Eon	5.2 mm / day
Different rainfall scenario's*	(mm)
Below average Average Above average	166 286 590

* Total rainfall during season

Rainfall figures (Figure 1) was obtained from the Lehurutshe Office of the North West Department of Agriculture. Underground water resource information was obtained from the Water Research Council and the ARC – ISCW in Pretoria. Temperature measurements were supplied by the South African Weather Buro (SAWB). The maximum and minimum figures are shown in Figure 2. Crop requirements regarding maximum and minimum temperatures for the Driefontein area were compared with the figures supplied by the SAWB.

4. RESULTS

4.1 Rainfall

The success of any agricultural enterprise is highly dependent on rainfall. Driefontein farmers are totally dependent on rainfall, due to the fact that irrigation is not possible. Figure 1 shows rainfall figures for the area from 2000 to 2007, as well as SWAMP simulation figures.

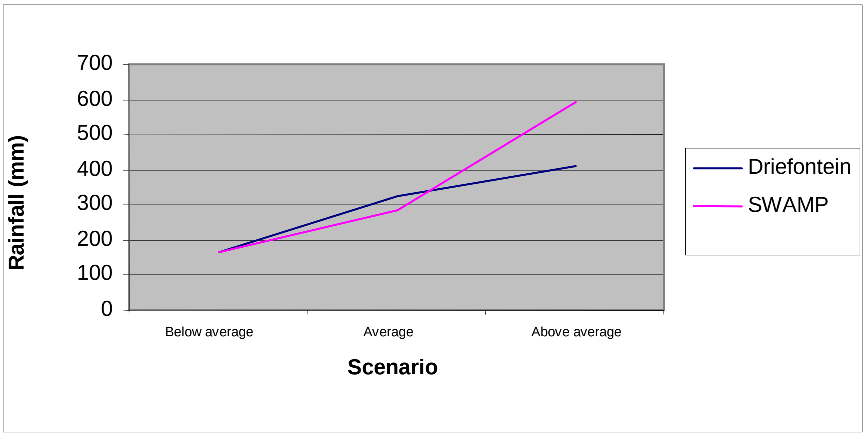

Figure 1: Average rainfall figures in the Driefontein district from 2000 tot 2007, and average SWAMP simulation figures.

It indicates very dry Winter seasons (June to August). Rainfall measurements were 8.4 mm in June, 0.6 mm in July and 2.9 mm in August, respectively.
A large part of Spring was also dry, with rainfall of 12.1 mm in September and 45 mm in October. Rainfall increased from November and reaches its peak in February, from where it started to decrease. The variation in rainfall figures accentuates the erratic nature of rain in this area. The yearly average rainfall was 325 mm p.a. with an aridity index of l, between 0.18 and 2. It indicates that this area can be classified as an arid to

semi-arid climatic region. Any agricultural enterprise in this area will fall in a high risk category.

4.2 Temperature

Temperature is a determinant when it comes to choosing crops for a specific region. Figure 2 indicates the maximum and minimum daily temperatures for the 2007 season (Weather station 0472278 O) for the Driefontein area (SAWB, 2008).

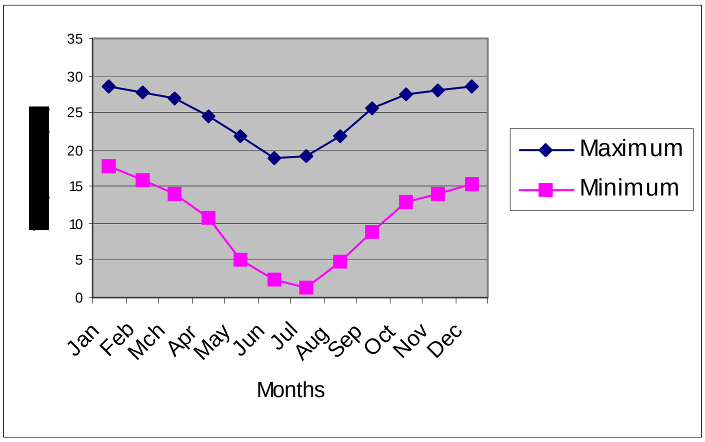

Figure 2: Indication of the maximum en minimum daily temperatures at Driefontein in 2007 (SAWB, 2008).

The highest maximum daily temperature in the Summer was 32ºC (December 2003 and November 2004). The latter and the lowest Winter temperature of 1.3ºC give an indication of the temperature spectrum to which Driefontein is exposed to. The average maximum daily Summer temperature of 28ºC, appears to be acceptable for crop production enterprises such as maize (16ºC to 32ºC), sorghum (10ºC to 30ºC) and sunflower (18ºC to 31ºC). The low average daily Winter temperatures of 4.5ºC might be a restrictive factor because such low late Spring and early Summer temperatures will affect the start of the planting season and the germination of the seed.

4.3 Soil

The geological description (Visser, 1984) classifies Driefontein as part of the Transvaal Succession, Pretoria Group and Rooihoogte Formation. The Land type 2524 Mafeking Memoirs 1:250 000 of the Research Institute for Soil and Irrigation indicates that Driefontein consists of mainly two land types, Ah16 en Ea9 (Du Plessis, 1987). The largest area of Driefontein falls within the Ah16 land type with a A4 terrain type and climatic zone 17S. The smaller Ea9 land type has a A3 terrain type with a 16S climatic zone (Du Plessis, 1987).

Figure 3 (a) represents the terrain morphology of Moshana and Figure 3 (b) represents the Rietpan terrain morphology. The relief is 130 to 450. The saturation density is low, between 0.5 and 2. The optimal production area has a 20% to 50% surface area with a slope decline of less than 5%.

(a) (b)

Figure 3: Relief images of Moshana (a) and Rietpan (b).

No detailed soil analysis were done, but according to the profile studies done it indicates that Moshana's soil can be classified as part of the Mooilaagte Family of the Clovelly (Cv) soil form (Kruger, 1983). The Rietpan soil was classified as part of the Lonehill Family of the Arcadia form (Kruger, 1983). Three profile holes were dug at Moshaha (Figure 4a) and one profile hole at Rietpan (Figure 4b).

(a) (b)

Figure 4: Images of the profiles at Moshana (a) and Rietpan (b).

The most important pedological properties of the soils at Moshana and Rietpan are represented in Table 3.

Table 3: Indication of the pedological data for the soil profiles at Moshana (Profiles1-3) and Rietpan (Profile 4) (Louw, 2007)

Profile	Soil type	Diagnostic horizons	Depth (mm)	Colouring	Clay content (%)	Structure
Moshana 1	Form: Clovelly Family: Mooilaagte	Ortic A Yellow brown Apedal B	0-380 380-1500	10YR5/8 7,5YR5/8	15 22	No structure No structure
Moshana 2	Form: Clovelly Family: Mooilaagte	Ortic A Yellow brown Apedal B	0-380 380-1500	10YR4/6 7,5YR4/6	19 25	No structure No structure
Moshana 3	Form: Clovelly Family: Mooilaagte	Ortic A Yellow brown Apedal B	0-300 300-1500	10YR5/8 7,5YR5/8	11 17	No structure No structure
Rietpan 4	Form: Arcadia Family: Lonehill	Vertic A Saprolite B	0-1500 1500 +	7,5YR4/0	55+	Strong structure

The Clovelly soil consists of between 11% en 19% clay in the A-horizon and between 17% and 25% clay in the B-horizon. This soil has no structure with an unspecified restrictive layer resulting in no water table development. The Arcadia soil at Rietpan has a +55% clay content in the A-horizon which causes cracks when drying out and can result in cutting of the roots of the crops and high levels of evapo-transpiration.

4.4: Human resource profile

Of the 218 respondents 27% is involved in animal husbandry and 42% is involved in crop production. The remaining 31% is subsistence farmers and/or are involved within the farming community.

Sixty four percent of the respondents are representing the older people who indicated that they have been staying in the area for more than ten years, yet they did not know the production potential of the area. Forty one percent of the farmers are older than 50 years. The other 59% is the farmers (middle aged – 30 years to 50 years old) who must replace the older farmers in the future. Of this 59% only 20% is practically involved in crop production activities. The rest do not regard agriculture as a career and are employed elsewhere. The older farmers are still using old traditional methods; change is slow which restricts their technological development. They have indicated that they still make use of traditional ways of pest control.

Sixty one percent indicated that they had no or very little educational training. The extent of illiteracy is therefore high. Seventeen percent had done some training at maize and sorghum production workshops conducted by the ARC, Grain SA and the Government.

There was a clear correlation between age, level of literacy and accounting abilities. Consequently it shows that the majority is unable to keep records, which is an integral part of sustainable commercial production.

4.5 Economic sustainability

The management of a commercially viable crop production system requires, amongst other things, a workable knowledge regarding accountancy and record keeping (book keeping). According to the results of the questionnaire only 45 out of 218 farmers had little knowledge about accountancy and it can be accepted that they will be able to understand production units like $kg.ha^{-1}$ or $R.ha^{-1}$, and fertilising units like (g $N.ha^{-1}$, kg $P.ha^{-1}$ en kg $K.ha^{-1}$. This group has higher potential to acquire competencies needed to manage sustainable commercial production enterprises. The accountancy incompetence of the rest of the farmers makes it highly improbable that sustainable commercial production decisions could be made by them.

Aspects like budgeting, production costs, yield values, income figures and bookkeeping represent only 41% of the records they keep. These aspects are very important in any commercial production enterprise. If farmers do not have control over proper recording and bookkeeping, it is merely impossible to run a sustainable agribusiness.

Table 4: ***Production data for maize as simulated with the SWAMP- model (Bennie* et al.*, 1998) for the Moshana region***

	Scenario's for the season		
Parameters	Above average	Average	Below average
Water balance components:			
Run off (mm)	369	330	190
Transpiration (mm)	339	291	114
Evapo Transpiration (mm)	29	38	76
Percolation (mm)	101	0	0
Yield (kg / ha)	6252	4306.92	118.27

Values from Table 4 indicate that water is a restrictive factor which jeopardises a viable maize production enterprise in Moshana, and this scenario can be made applicable for other crops. During above average seasons a potential maize yield of 6 $t.ha^{-1}$ can be achieved, during an average season 4 $t.ha^{-1}$ and during a below average season a yield of 0.12 $t.ha^{-1}$ can be achieved (SWAMP). Percolation causes water losses of 101 mm p.a.

In the Rietpan area where the Yield Targets Chart was used to simulate production figures, it was shown that during an above average season a yield of 3.5 $t.ha^{-1}$ can be achieved, during an average season a yield of 1.6 $t.ha^{-1}$ is possible and during a below average season the yield will be so low that it will be impossible to produce crops according to commercial production criteria.

The Ceres-Maize model (du Toit, 1997) supplies a more realistic simulation and indicates that a yield of 2.8 $t.ha^{-1}$ is possible when rainfall is 400 mm p.a. within soil with a 15% clay content, and 2.9 $t.ha^{-1}$ within soils with a 25% clay content. The standard reflection which was taken into account was 1.3. Driefontein has an average annual rainfall of 325mm p.a. which means the yields will be lower than 2.8 $t.ha^{-1}$ or 2.9 $t.ha^{-1}$. If the commercial production potential of the farmers is taken into account, the yield will be even lower.

Figure 5 indicates existing infrastructures on the farms. It is clear that a small percentage of farmers (<10%) has basic infrastructures at their disposal. These infrastructures are in a poor condition.

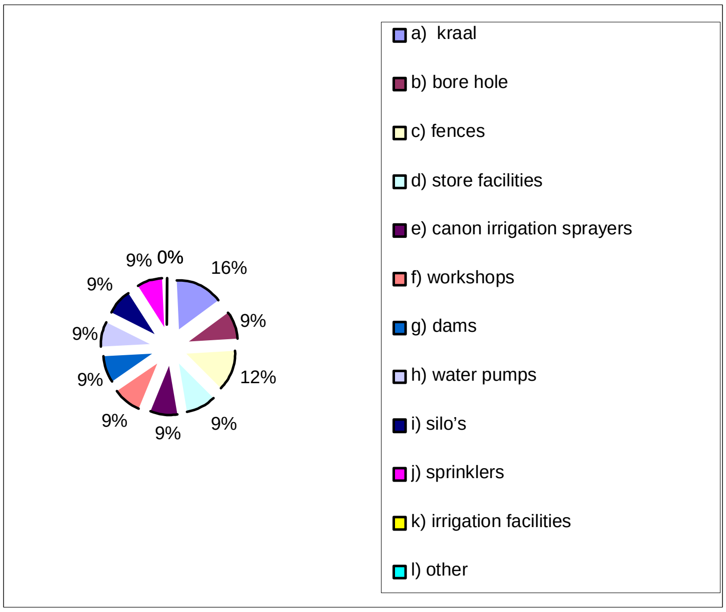

Figure 5: Percentage respondents having infrastructures at their disposal.

Figure 6 indicates the percentage of farmers which have appropriate equipment to execute proper agricultural activities.

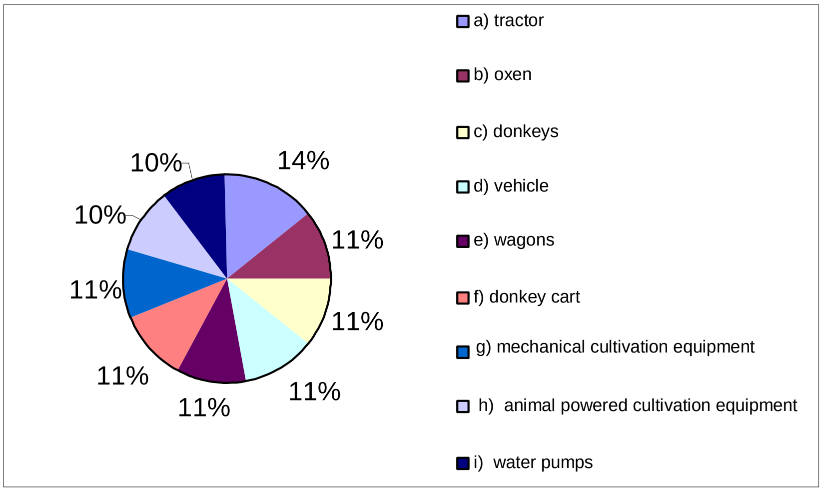

Figure 6: Resources available.

It is shown that the only technologically advanced implements they own are tractors. Due to the lack of implements, sowing and fertilization are done by hand which result in a very uneven distribution of seed and fertilizer. This process is also not economical, when considering commercial production criteria, since an uncontrolled amount of seed and fertilizer are used. Accessibility to markets where they can sell their products is a major obstacle. Even if these farmers had access to markets, the bad road conditions affect them negatively. Mechanisation is another critical aspect which needs attention, if the farmers want to become sustainable commercial producers.

The pieces of land they cultivate were received from the Chief (30%), inherited (20%), from the Government (32%) and through buying (18%). A number of farmers (semi-commercial and share croppers) also rent extra land and they can be characterised as emerging farmers. Of the total cultivated land they are utilizing

(659ha) sorghum is cultivated on 34%, maize on 27%, beans on 15%, sunflower on 12% and vegetables on 12%.

Only 9% of the respondents indicated that their main source of income is coming from their crop production enterprise. The income they obtained from their crops is between R700 p.a. to R1 000 p.a. (40%), 30% of the farmers get between R1 000 p.a. to R4 000 p.a. and 30% of the farmers get R7 000 p.a.

The total annual expenditure is shown in Figure 7. The three input parameters representing the highest expenditure levels are fuel (R3 216), seed (R1 794) and labour (R1 335). It is clear that the farmers set a low priority to input commodities such as fertiliser, herbicides and insecticides.

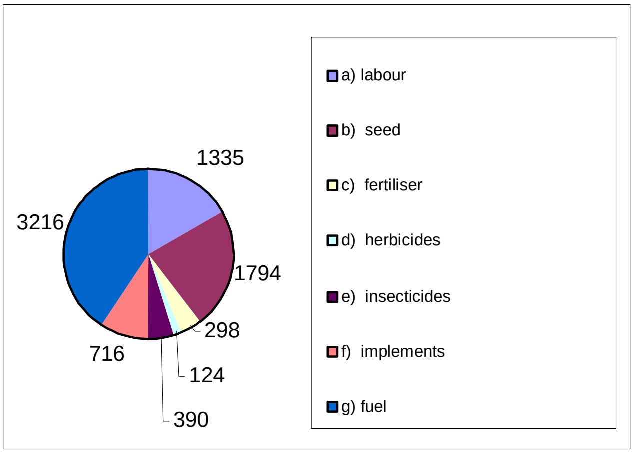

Figure 7 Expenses of the farmers' crop production systems.

Income from their crop production systems were calculated as follows:

Maize

Twenty seven percent (177 ha) of the total cultivated land was used for maize. They harvested 227 bags, therefore gained an income of R13 620 (227 x R60 per bag). They have indicated that 9% of the farmers are crop producers, therefore their income will be an average of R717 per farmer.

Sorghum

Thirty four percent (222 ha) of the total cultivated land was used for sorghum. They harvested 256 bags, therefore gained an income of R51 200 (256 x R200 per bag). They have indicated that 9% of the farmers are crop producers, therefore their income will be an average of R2 694 per farmer.

Sunflower

Twelve percent (80 ha) of the total cultivated land was used for sunflower. They harvested 90 bags, therefore gained an income of R13 950 (90 x R155 per bag). They have indicated that 9% of the farmers are crop producers, therefore their income will be an average of R734 per farmer.

Beans

Fifteen percent (99 ha) of the total cultivated land was used for beans. They harvested 44 bags, but the income could not be calculated because the farmers could not supply the price they have received. It appears that most of the beans are used for household purposes.

Vegetables

Twelve percent (81 ha) of the total cultivated land was used for vegetables. The income could not be calculated because the farmers could not supply the yield or the

price they have received. It appears that most of the vegetables are used for household purposes.
Given the income they obtained from their crop production it is evident that the average profit a farmer made was R63 (maize), R235 (sorghum) and R64 (sunflower) per production season, respectively.
Almost all the respondents indicated that they experience crop damage. They indicated that the main reason for the losses is drought, and to a minor extent damage caused by birds, stray animals, theft, diseases and pests. Damage caused by incompetency and monoculture practises are not considered a risk by the farmers.
According to Figure 8 the majority of the farmers indicated that their greatest need is training to combat their lack of agricultural knowledge.

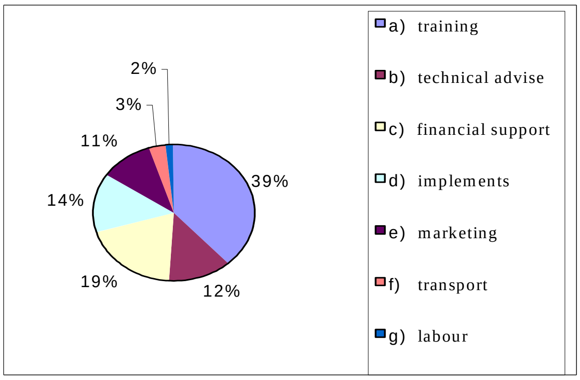

Figure 8 Needs identified by the farmers.

The farmers indicated that 31% of them were visited by external role-players on a weekly basis to assist them with training, 27% received visits on a monthly basis and 21% were visited on a six monthly basis. Although they have indicated that they receive training, the potential end product was not achieved.
According to the farmers they do not regard their farms to be profitable enterprises. A community orientated approach seems to be the main reason for them to be involved in agriculture. This appears to be more important than the other aspects such as economics, optimal yields, resource management and to manage a sustainable agribusiness.
They regard the most important aspect of their enterprise to be a source of food (139 out of 218 respondents) and prestige (131 out of 218). Production for household purposes (140 out of 218) is regarded more important than to obtain an income (125 out of 218). It is obvious from Figure 9 that the farmers are not commercially inclined (107 out of 218). This figures show that the farmers' main aim is to support themselves, as they did for many passed years. As mentioned it appears that only the half-commercial group has the inclination to produce commercially. The question arises, "Does the majority of the people want to become commercial farmers?"

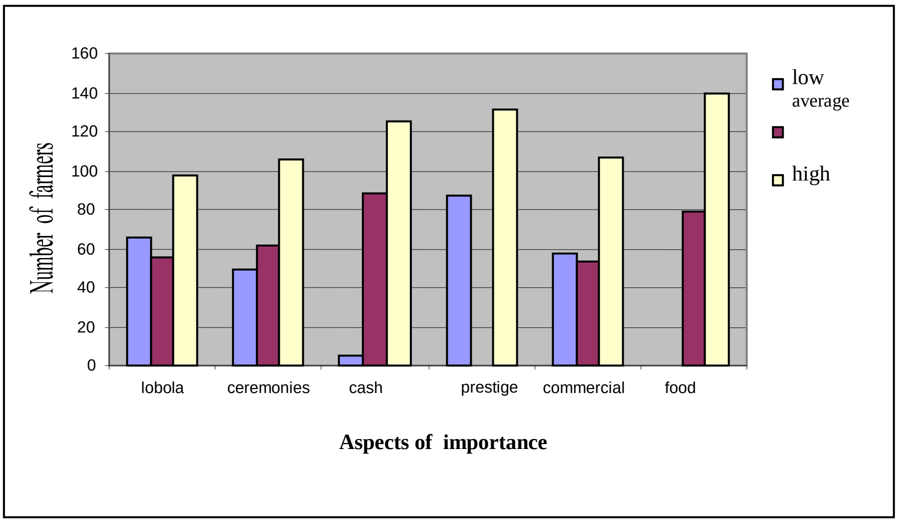

Figure 9: An indication of the value farmers apply to aspects involved in crop production.

It is indicative from the figures supplied by the farmers that they are evaluating their agribusinesses using a different frame of reference compared to what is needed for a sustainable commercial production enterprise.

5. CONCLUSION

The two types of soil (Clovelly en Arcadia) occurring at Driefontein are suitable for crop production. However, according to the SWAMP simulation figures and real production figures supplied by the farmers, it is clear that the circumstances at Driefontein are not suitable for sustainable commercial crop production enterprises. The management skills of the farmers are low and therefore commercial production is unsustainable. A realistic maize yield will be 2.8 $t.ha^{-1}$ and sorghum yields can reach 1.5 $t.ha^{-1}$, which do not comply with the sustainable commercial requirements. The 218 farmers produce a total of 18 t of maize, 20 t sorghum and 7 t sunflower on a total of ± 660ha, which proves the unsustainable situation from a commercial orientation.
Regarding the economic commercial sustainability, it is clear that the infrastructures, accountancy literacy and support systems the farmers have to their disposal are insufficient to maintain a sustainable agribusiness. The production units per farmer are too small to justify a sustainable crop production system according to commercial criteria. The condition of the infrastructures adds to the unsustainability of the farmers' production units. Even though some of the farmers are utilizing 40 ha of land, they will only be able to be self supportive. Attempts to develop the underdeveloped farmers into commercial crop farmers are not possible in the extensive areas where they are situated. They will stay bound to LEIA which restrict any possible progress. These farmers however, will only be able to sustain a livelihood of their choice and support their families.
Farmers are important natural resources involved in crop production. The conclusion can be drawn that the farmers of Driefontein are not equipped to maintain a sustainable commercial crop production system. In spite of efforts by different role-

players, a conclusion can be drawn that the farmers need education and training. Regarding their cultural-historical link with agriculture, it appeasers that the farmers do have wisdom regarding agriculture, but lack the skills and knowledge to manage a commercial crop production system. Seventeen percent of the farmers have the capacity to be developed into commercial farmers. The rest (inactive land owners and opportunists) must be supported to gain access to alternative work (income) opportunities. This will result in more land available to the half-commercial and share-cropper farmers showing potential to become commercial farmers. Furthermore, the majority of the farmers are old and therefore they cannot meet the demands involved in a sustainable commercial production system.
It can be concluded from the survey done at Driefontein that the opinion of the farmers is that their crop production systems are socially acceptable. The farmers enjoy a high level of community involvement in their production systems. The lack of purposeful support structures and inter-institutional fragmented approaches are causes adding to the stagnant state of the commercial agricultural sector at Driefontein. There appears to be a gap between technology transfer which was done, and the application of the technology and knowledge which must result in a sustainable agribusiness.
Due to the cultural-historical background of the farmers, all of them want a piece of land to plant something, whether it is profitable or not. The frame of reference of the farmers and their traditions influence their approach, cognitive processes and perceptions towards agriculture. Changes are needed if these farmers want to become commercially viable farmers.

6. RECOMMENDATIONS

The following general recommendations are an attempt to guide the Driefontein farmers in becoming sustainable commercial producers. The management of renewable and non-renewable resources is essential in any agribusiness. Natural resources e.g., soil, cultivated land and water must be utilised sustainably. Due to the fact that Driefontein has a hot and dry climate, it is important to choose crops which are adapted to these climatic situations. Farmers must take climate, crop characteristics, topography and location into consideration to decide whether a specific crop can be produced commercially sustainably.
Knowledge regarding soil types must be obtained because it determines which production techniques should be applied. The dissemination of knowledge is important in an attempt to teach farmers the correct management principles and how to conserve their natural resources, which affect the production potential of their soils. Successful implementation of the knowledge depends on the way the knowledge gets disseminated. The following steps can be recommended *(Nonnan* et al.*, 1982, soos in* *http:///www.fao/doc*):

* *on-farm demonstrations and research*
* *multi-disciplinary training regarding transformation, participating management, farm planning, problem solving and economical management of an agribusiness*
* *forming of farmer workgroups*
* *identification of leader farmers*
* *proper needs analysis*
* *clear definition of participating decision making*
* *applaud achievers*

* *constant retrospection and control*

The program to create sustainable commercial producers must be structured in such a way that the farmers can be transformed from their present situation to a situation where aspiring farmers (half-commercial and share-croppers) would like to be. Research and training to achieve this must aim towards ecological, socio-economical and community orientated dynamics of the emerging farmers.

The following steps can be implemented to develop an uniform strategy through which farmers can be put on the road to success:

* what is needed to develop a national training programme / development strategy
* the content of the programme must address the sustainable development of the emerging farmers
* a date for the development and implementing of the programme, together with a date of completion of such a programme must be set
* constant monitoring, evaluating en auditing must be done

The programme must equip farmers technologically in such a way that they will be able to manage a sustainable agribusiness. Demonstration trials, where the farmers are practically involved, will help them to get use to the new concepts. The development of the farmers must also be aimed at the community, to put the farmers who underwent the training in a position to help other farmers. Farmers must learn that through decreasing the plant populations per hectare, better water harvesting and less fertiliser needs will be achieved. This will lead to a cut in input costs. Although the yield will be a bit lower, healthier plants can be achieved and the farmer can be sure of a harvest, compared to crop damage and/or the loss of the complete crop during dry spells. The farmers should also learn that the use of commercial hybrid seed has an advantage above using seed from their own harvest. Using own seed causes lower yields due to the loss of vigour and the development of segregation. If they want to use their own seed they should plant open pollinated cultivars. This will furthermore lower input cost. Although commercial seed costs more, it produces higher yields. No –till, stubble cultivation and fallow lands are some examples of production methods which conserve natural resources and reduce input cost, resulting in a sustainable production system.

Planting dates should correlate with optimal soil water content. Higher yields can be achieved when planting in damp soils, compared to planting in soils with a dry profile.

Drought and crop damage are regarded by the farmers as the main reasons for low yields. The emerging farmers will have to be prepared to apply new technologies to combat losses, if they want to improve their production systems.

External funding will only become available if the funders can be assured of returns on their investments, which is not possible at present. Economic support can be obtained from the government through the LRAD initiative. Loans can be obtained from the Landbank.

The potential commercial farmers (semi-commercial and share croppers) must get training regarding record keeping. While undergoing the training they will become accustomed to the proper terminoligies necessary in managing a sustainable agribusiness. The National Water Research Commission developed a system through which each farmer’s land gets charted. This allows a farmer to know exactly the farm size and location of resources. This initiative developes a feeling of pride and the farmers take ownership and responsibility over their own production unit. This has

improved farmers' economic sustainability (personal communication: Van Rensburg, 2008).
The availability of markets and the accessibilty to the markets must be improved. Due to its geographical position and bad road conditions, Driefontein is cut off from major markets. This factors restrict them to their local markets, friends and family where they can market their produce, which is detremental to their economical sustainable progress.
It is important to approach farmers in such a way that they feel that their problems are attended to. The social acceptance of a new project / concept is determined by the ability to mobilise the community, development of the farmers' capacity, to empower them and to improve their self respect. This will only be achieved through a purpose driven, good co-ordinated development programme. A pre-requisite to such as programme is that the community should be the central focus point of this programme and they should be responsible for the decisions to be made. Part of this plan should be an initiative to mobilise the youth. Schools should be involved in creating development strategies to identify future farmers and to motivate them to consider a career in agriculture.
Farmer societies should be put in place. This is the place where farmers can share ideas, network with major role-players, and the society can represent them when their rights as farmers are in jeopardy. Through the society they can stay in line with the latest developments in agriculture.
The Driefontein area is categorised as a semi-arid to arid climatic region, therefore an extensive animal production system should be considered as a more sustainable production system for the area.
Farmers should however accept the fact that they need not jeopardise their identity, but to become sustainable commercial farmers they will have to let go of their traditional cultural-historical concepts of crop production.

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