

## CHAPTER 3

### STUDIES IN SELECTED COMMUNITIES

Comparative studies were carried out in three diverse areas of the province, viz. Mdantsane, Middledrift and Sterkspruit/ Herschel. This was done to compare the factors that cause soil erosion.

#### 3.1 MDANTSANE

##### 3.1.1 General description of the area

Mdantsane is the second largest township in South Africa and is situated about 15 km southwest from the city centre of East London. Mdantsane is situated in a steeply undulating area with hills with broad crests and deep, narrow gorges with very steeply sloping sides. The township has developed on the crests, with no residential development in the gorges, including their sides. This township is overpopulated and has got a very high rate of unemployment, hence people have resorted to intensive crop production in the open areas throughout the township, including the sides of the gorges where the terrain is very steep (Plate 3.1).



**Plate 3.1 – General layout of Mdantsane on hilltops (Photograph: N.N. Maswana)**

There is a certain similarity between Mdantsane and a city like Antananarivo, capital of Madagascar, where all the urban development is on the crests of hills, with intensive rice and vegetable production on the wide, fertile valley bottoms of the valleys running through the city (Laker, personal communication). The difference is that Mdantsane has very narrow gorges, with insignificant narrow valley bottoms.

### 3.1.2 Research procedures

The research procedures used in information gathering was interviews of individual “farmers” or land users in the area. However, it was difficult to engage them in meetings because they are too many, they come from different units of the township and they are not organized. Some of the farmers did not open up with me, as they were suspicious that I was sent to investigate their activities.

Information was also gathered on the farming practices. This was done through interviews and field observations over three years (1997 –1999).

Studies of the soils and parent material were carried out through the study of soil profiles on road cuttings. Augering was also done.

### 3.1.3 Results and discussion

The people in Mdantsane mainly produce maize (for consumption as green mealies) and vegetables. Both crops are produced primarily for domestic consumption. However, any surplus is marketed locally in the township.

Cultivation takes place on slopes with gradients of more than 20%. However, the soils do not erode at all. There are not even slight signs of erosion. Reasons for this unexpected situation include:

- a. The parent material of the soils is dolerite and the rainfall is high (800- 1200 mm per annum). The combination of high rainfall and dolerite results in a high rate of weathering, giving deep and stable red soils, i.e. soils of the Shortlands form and clayey soils of the Hutton form (Soil Classification Working Group, 1991). In other parts of the former Ciskei such red soils developed from dolerite, especially Shortlands soil, have been proven to be exceptionally stable against erosion (e.g. D’ Huyvetter and Laker, 1985; Rapp, 1998).

- b. Good agricultural practices are used by the cultivators. Due to the steepness of the terrain, the farming community of Mdantsane does not use mechanized farming implements. They cultivate their land by hand, using hoes. This type of farming results in less soil disturbance and soil moisture is retained. The soil organic matter is not destroyed. Cultivation only takes place in spring and summer. In winter the soil is left to lie fallow, thus leaving the stubble to rot and form good organic matter, which stabilizes the topsoil structure. The stubble also protects the soil from the destructive winds in winter and the intense spring rains. The retention of the stubble and its positive effect on soil organic matter is totally different from the situation in the traditional rural areas, where the stubble is used as winter grazing for the large livestock populations and very little organic matter is returned to the soil. In earlier studies in Mdantsane it was found that some of the urban farmers even make compost from grass which they cut outside the city and apply it when they plant vegetables (Laker, personal communication).

In view of the above it was learnt that the slope alone is not the major cause of soil erosion. Stable soils can be cultivated safely even on steep slopes. It also became clear that good farming practices are keys to soil conservation.

The cultivated plots belong to the Municipality. However, individuals simply started cultivating certain areas and nobody chased them away. Although they do not own the land, the fact that there are no tribal systems involved according to which land is allocated and can be taken away at any time, seemed to be a plus point. Surprisingly theft did not appear to be a problem due to the coherent nature of the community. Mdantsane community is old, people have been living together for many years and therefore they respect each other. Local disciplinary structures or police forums exist throughout the township and they ensure stability in the area.



## **3.2 MIDDLEDRIFT**

### **3.2.1 General description of the area**

Middledrift is about 100 km west of East London and about 500–600 m above sea level (Hensley and Laker, 1975). According to Hensley and Laker (1978) the Middledrift pedosystem is produced by the tributaries of the Keiskamma River that dissect the Debe pedosystem at the western and southern peripheries. The two authors describe the Middledrift land type as steeply undulating.

The area is relatively dry with an average annual rainfall of 499 mm and evapotranspiration of about 829 mm resulting in a water deficit throughout the year (D'Huyvetter and Laker, 1985). It is a summer rainfall area with poorly distributed rainfall that comes in the form of intense thunderstorms.

Soil erosion is widespread throughout the land type. The vegetation cover is very poor due to overgrazing and some undesirable invader species exist.

### **3.2.2 Research procedures**

The area was traversed a number of times looking at the soils, vegetation and, more importantly, soil erosion. Soil profiles were studied in open gullies and augering was also done. The soils were classified at series level, using the gullies as soil profiles.

The vegetation was also looked at, but in less detail.

### **3.2.3 Results and discussion**

The soils of the area are young, shallow and mainly derived from mudstone (D'Huyvetter and Laker, 1985). These soils are predominantly unstable and unsuitable for cultivation. The main soil forms present are: Glenrosa, Valsrivier, Oakleaf and Shortlands (D'Huyvetter and Laker, 1985).

Out of the soil forms mentioned above Shortlands is the most stable and suitable for cropping. The Shortlands soils are derived from dolerite, which weathers into deep red soils with well-developed, stable structure.

Unfortunately dolerite outcrops are of very limited extent in the Middledrift area and consequently the Shortlands soils cover only very small areas.

Even though the Oakleaf soils in the area are much better than the soils of the Glenrosa and Valsrivier forms, they are not very stable and even with proper contouring cannot be cultivated at slopes of over 7,5% without causing serious erosion. The very unstable pseudoduplex (Valsrivier) soils, derived from grey to yellow mudstone, found on the footslopes and valley bottoms and the young, shallow and very unstable soils of the Glenrosa form are extremely vulnerable to erosion (D'Huyvetter and Laker, 1985). Even with proper contouring the Valsrivier soils and shallowest soils of the Glenrosa form cannot even be cultivated at slopes of more than 3,5%.

According to D'Huyvetter and Laker (1985) the planners of the "betterment schemes" overlooked the different sensitivity levels of the various soil types. Consequently they used a single threshold slope criterion of 12% for all soil types occurring in the area. This was a huge mistake by the planners as it resulted in widespread erosion in cultivated areas despite contouring.

Widespread serious soil erosion is a problem at Middledrift even in grazing land. This is due to overgrazing that leaves the unstable soils of the area exposed to the rainstorms. The vegetation in the area is very sparse due to the poor quality soils and low rainfall, but is very palatable and is consequently very easily overgrazed

The sharp contrast between Middledrift and Mdantsane came out clearly. There is very severe erosion of cultivated fields in Middledrift despite relatively flat slopes and contouring whilst in Mdantsane slopes as steep as 20% are cultivated without soil erosion. The betterment planning in Middledrift contributed a lot to the erosion of the area as people were moved closer together thus putting more pressure on the fragile resources. As a result of the betterment planning, the siting of arable lands was imposed on the people by the planners. However, in Mdantsane the people chose the plots they want to cultivate on their own without any form of pressure from outsiders. In Middledrift the stubble is used as winter grazing, whereas in Mdantsane it is left on

the land, thus protecting the soil from the desiccating winter winds and erosive spring rain. The stubble left in the cultivated areas also rots and forms good organic matter.

The differences in rainfall and parent materials between Mdantsane and Middledrift are also important. In Mdantsane the parent material is dolerite and the rainfall is high, thus resulting in a high rate of weathering which results in deep and stable soils, while the opposite applies in Middledrift.

Despite the low population densities in Middledrift compared to Mdantsane, poor planning, poor soil, low rainfall and poor agricultural practices have resulted in widespread erosion in Middledrift.

### **3.3 STERKSPUIT/HERSCHEL**

#### **3.3.1 General description of the area**

Sterkspruit and Herschel are towns situated  $\pm$  100 km southeast of Aliwal North. The high-lying areas have high rainfall and the parent material is basalt. The combination of the two factors results in more stable soils. However, in the lowland areas the rainfall is much lower, averaging only  $\pm$  450 mm/annum (Herschel Development Trust, unpublished) and the parent material is purple/red mudstone, thus resulting in poor quality solonetzic duplex soils of the Estcourt and Sterkspruit forms. These soils are very sensitive to erosion, hence soil erosion is widespread throughout the low-lying areas of Sterkspruit and Herschel.

More than 70% of the area consists of rock outcrops and very shallow soils (Hensley and Laker, 1975). The area is overgrazed and that has resulted in the exposure of the fragile soils to the rainstorms that are often encountered in summer (Plate 3.2).





**Plate 3.2 – A typical Sterkspruit/Herschel scene with rocky mountains and severely overgrazed and eroded lowlands (Photograph: N.N. Maswana)**

### **3.3.2 Research procedures**

Studies were conducted in Sterkspruit and Herschel between February 1996 and January 1997. The objective of the study in these areas was to gain an understanding of the reasons for the failure of soil conservation attempts by government, whilst the intervention by the two Non-Governmental Organizations (NGO's), Environmental Development Agency (EDA) and Herschel Development Trust (HDT) seemed successful.

Various soil conservation works were visited and the affected communities were interviewed. The extension officers from both NGOs and the Department of Agriculture and Land Affairs were interviewed.

A broad assessment of the vegetation, climate and the soils was also done, as they are the critical factors determining the resistance of the soil to erosion.



### 3.3.3 Results and discussion

As erosion is frightening in the areas, the Department of Agriculture initiated a soil conservation programme in the area. According to the informants the main emphasis was on an engineering approach. That is, stone packs and some concrete walls were constructed to close the gullies. Apparently local people were employed to do the work under the supervision of officers from the Department of Agriculture (Mehlomakhulu, personal communication).

It was learnt that:

- a. In some areas the job was left unfinished and some of the stone packs were vandalized.
- b. The community identified those areas as “government areas”.
- c. No effort was made to address the socio- economic problems of the area.

From the above it became clear that people perceived the initiative as a job creation programme and therefore sabotaged the programme by vandalizing the stone packs in order to continue doing the same thing over again, thus ensuring sustainable income through continued employment. This has led to dependency in various ways and has resulted in laziness within communities.

The communities were not given an opportunity to make inputs in the programme, hence the wrong perceptions. All this resulted in lack of continuity and the people didn't learn much from it. It is also assumed that a lot of money was wasted even though the intention was good.

In 1992 EDA and HDT started similar projects in the same area. However, their approach was different, as they involved the local communities from the start. Extension officers were identified within the communities and trained in environmental management (Tim Fenn, personal communication).

It was also observed that an old man, Mr. Shadrack, a Coville village (Herschel) resident has initiated soil rehabilitation in an eroded piece of land next to his homestead. Mr. Shadrack constructed a dam, which collects water that flows from a badly eroded hill. Everyone in the community has free access to the water from the dam. However, water is seeping continuously out of the dam and this has resulted in a permanent wet area below the dam (artificial wetland). It is on this 'wet land' where Mr. Shadrack has planted reeds that are not only perfect in the rehabilitation of the area, but are also used widely in the area in the construction of houses (old reeds) and ceilings (young reeds). The area is well reclaimed and the old man is also making money from selling the reeds, as the community believes that reeds are durable and easy to use as they are flexible enough to bend to the desired stature. From this it was learnt that a developer must not underestimate the effectiveness of indigenous knowledge in addressing local problems.

The product of the work by the two NGOs is still visible in the area even though HDT closed down due to funding problems. The trained extension officers are still serving their communities and this has ensured continuity of the work despite lack of funding (Shibane, personal communication).

It was also observed that the communities are taking turns in looking after the project areas and that fencing off of badly eroded areas has resulted in quick recovery or closing up of the gullies. It was also learnt that the approach ensured community participation and the communities took the lead in the project. However, in the government initiative, the Programme was run by the government with no input from the land users.

A study was consequently conducted in an equally eroded area where the traditional approach to soil conservation has failed, to establish whether a community-based soil conservation approach could succeed in the Eastern Cape and to develop a model for such approach. The study is described in Chapter 4.