CHAPTER 2

OVERVIEW OF THE SOIL DEGRADATION SITUATION IN THE EASTERN CAPE

2.1 BACKGROUND ABOUT THE EASTERN CAPE

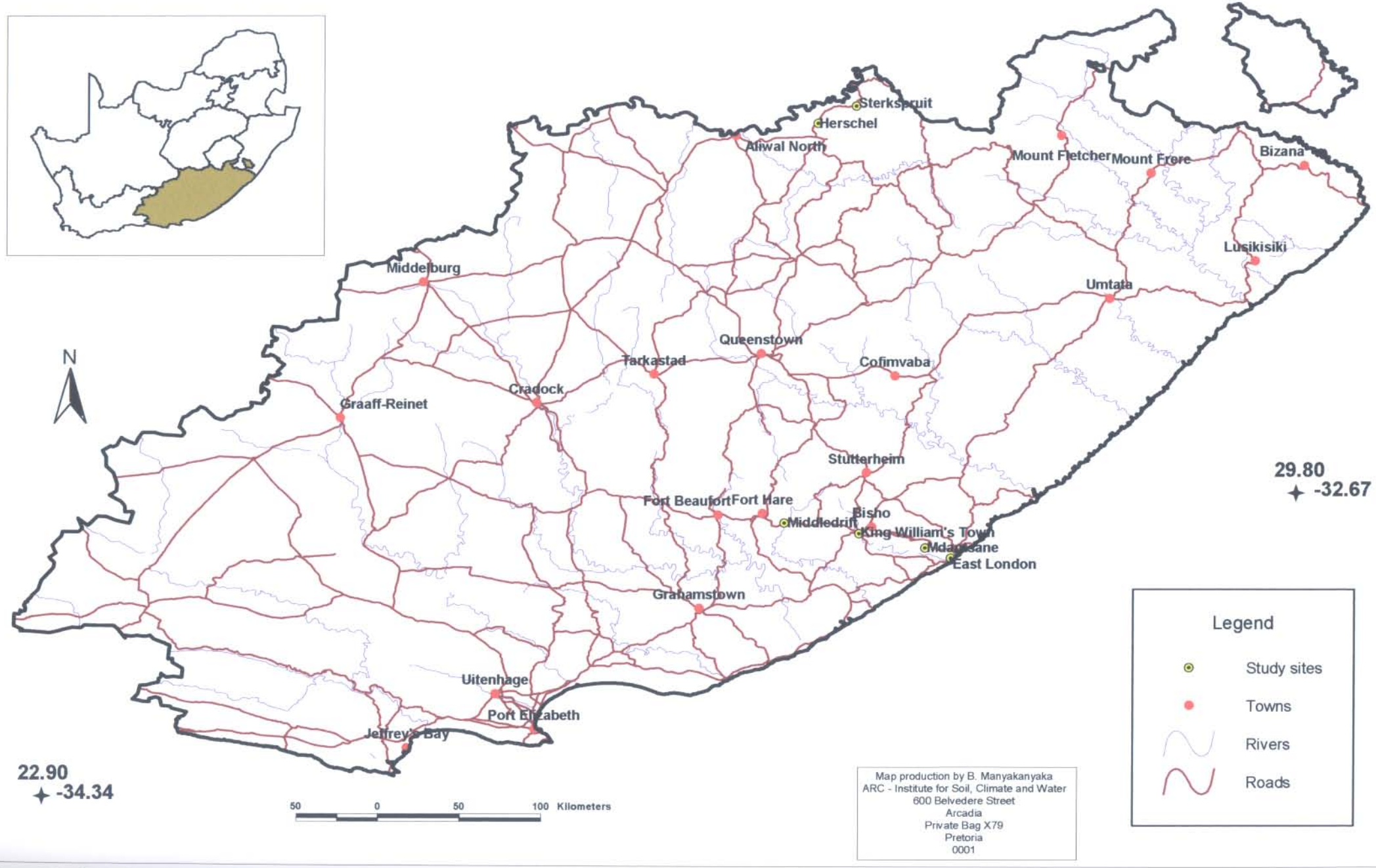
The Eastern Cape Province is situated in the southeastern part of South Africa and include the former homelands of Transkei and Ciskei and parts of "white" South Africa that used to be known as the Northeastern Cape, Border and Eastern Province as well as the eastern fringes of the Karoo (Figure 2.1).

The Eastern Cape province is the second largest and poorest province in South Africa. The incorporation of the former homelands of Ciskei and Transkei into the province has brought extreme poverty. Densely settled rural populations, which depend on external income, are characteristic of these parts of the province (Clarke and Dickson, 1996).

It is an overpopulated province with a high unemployment rate. Most able-bodied men and some young women have migrated to cities for jobs, leaving women and old age pensioners behind. Subsistence agriculture (extensive cultivation, stock farming - mainly of indigenous breeds) is the main activity in the highest potential parts of the province (De Wet and Van Averbeke, 1995). The semi-arid climate prevailing in a large part of the province, together with a fragile resource base have inflicted extensive damage on the Eastern Cape's environment. Another problem facing the Eastern Cape is lack of extension services to provide the necessary advice to farmers. The report edited by De Wet and Van Averbeke (1995) gives a comprehensive overview of the overall situation in the Eastern Cape.

2.2 THE NATURAL RESOURCES OF THE EASTERN CAPE

The Eastern Cape is a resource poor province in terms of natural resources. Poor crop yields and livestock conditions are clear indications of the quality of the resources in the region.



The Eastern Cape occupies a peripheral position in terms of economy within South Africa (Bruton and Gess, 1988). The main contributing factors to this are:

a. Resettlement, that is, people were moved from areas where their lives were stable to isolated areas, e.g. Glenmore, Thornhill etc.
b. Bad agricultural practices have led to poor yields and soil erosion, e.g. cultivation on steep slopes and/or frequent tillage that leads to exposure of the soil to erosion and loss of soil moisture. Bad agricultural practices can also lead to desertification.
c. Land ownership. Only few individuals own land and most people access land through communal land tenure.

Due to the above three factors, coupled with overpopulation, the efforts of farmers to produce good quality produce are in vain. The resource base gives an indication of the relationship between man and the environment. This is evident from the advancing desertification as a result of destruction of the natural vegetation exposing the soil surface, causing it to heat up (Ramphele and McDowell, 1991).

Aspects covered in this section are:

a. Climate
b. Soils
c. Vegetation

2.2.1 Climate

The Eastern Cape Province receives most of its rain between late spring and early autumn, but the biggest part of the province is not a true summer rainfall area. Rainfall peaks occur in late spring/early summer and late summer/early autumn (Marais, 1978). A mid-summer drought, which is of much longer duration than that described for the Northwest Province by Mbatani (2000), is characteristic for most of the province. A mid-summer drought has serious negative implications for the growing of summer crops, especially maize (Mbatani, 2000).

According to De Wet and Van Averbeke (1995) the mean annual rainfall in the province increases from a minimum of about 175 mm in the southwest to a maximum

of over 1000 mm in the northeast, with an average of less than 400 mm in the west and more than 1000 mm in the northeast, the coastal areas and some mountain regions (e.g. in the Winterberg and Amathole mountains).

Rainfall averages in the province vary dramatically over quite short distances. Two types of effects are found in this regard:

a. Orographic effects of moist winds from the ocean being forced up by the mountains, giving much higher rainfall in the mountains than a few kilometers away on the "coastal plateau". A striking example from the former Ciskei is the barely 500 mm average annual rainfall at Middledrift compared with 1500 mm at Wolfridge a short distance away in the Amathole mountains (Marais, 1978).
b. Rainfall in all the hot, narrow river gorges is much lower than on the surrounding plateau. An example from the former Ciskei is the average annual rainfall of less than 400 mm at Dank den Goewerneur in the Keiskamma river gorge near Middledrift, compared with more than 500 mm at Middledrift on the plateau (Marais, 1978). See Map 2.1.

Rainfall is very unreliable, both within and between seasons, and comes in the form of intense thunderstorms. Both of these are major contributing factors to the extreme soil erosion found in the province. (See Section 2.4.1.)

The poor rainfall conditions of the region adversely affect (a) soil formation and the quality of the soils (Section 2.2.2), as well as (b) the vegetation cover (Section 2.2.3) and (c) soil erosion (Section 2.4.1).

The Eastern Cape is blessed by having relatively mild temperatures compared to other parts of the country, e.g. Free State (very cold in winter), Northern Cape (cold winters and extremely hot summers). However, frost is common during winter months in high lying areas (like the Amathole mountains) and the areas bordering Lesotho and the Free State. The coastal belt is frost-free. Map 2.2 shows the longterm average temperatures.

Winds tends to be strong. Hot berg winds are common during dry months resulting in frequent veld and forest fires.

2.2.2 Soils

Rainfall and temperature are the dominant climatic factors affecting soil formation and soil stability (Laker, 2000). Rainfall in the province is unreliable and in most areas low, leading to very poor soils, which are highly unstable and thus prone to erosion. In areas with high or efficient rainfall and increased temperatures, deeper and more stable soils are produced (Laker, 2000). However, in the Eastern Cape there are limited areas with the ideal climatic conditions and hence most of the province is dominated by shallow, unstable and less developed soils or highly erodable soils.

In the majority of areas in the region the soils are fragile. Poor soils are as a result of low rainfall and poor parent material. The higher the rainfall, the faster the rate of weathering, the deeper the soil, and *vise versa*.

Shallow soils are less stable and wash away easily by rainwater. In most areas of the Eastern Cape the parent material is sandstone, mudstone or shale of the Beaufort Group, resulting in poor soil. Solonetzic soils derived from mudstone and shale of the Elliot formation and Tarkastad subgroup are extremely vulnerable (Laker, 2000).

However, there are few areas with good stable soils, e.g. Mdantsane, Butterworth, Katberg, Stutterheim, Bizana, Luskisiki, etc. In these areas the rainfall is high (>700 mm/annum) and the parent materials are dolerite and Ecca or Dwyka sediments, giving rise to deep stable soils.

Map 2.3 outlines the broad soil patterns of the Eastern Cape. The dominance of poorly developed highly erodable soils due to unfavourable climatic conditions and geology cannot be overemphasized. The coastal plateau of the province adjoining the Karoo is dominated by soils of the Glenrosa form, which consist of shallow soils (Laker, 2000). Laker (2000) describes the Glenrosa form soils in this area as soils associated with mudstones and shales of the Adelaide subgroup of the Beaufort formation. As the rainfall increases towards the east, moderately deeper soils are encountered.

The northern part of the province is dominated by solonetzic soils. Solonetzic soils are soils with structureless sandy topsoil overlying clayey subsoil with coarse angular blocky, prismatic or columnar structure (Laker, 2000). These soils are associated with mudstones and shales of the Tarkastad subgroup and the Elliot formation. Examples of the solonetzic soils that occur in the Eastern Cape are Estcourt, Sterkspruit and Valsrivier forms (Laker, 2000).

Hard plinthite is also found in the province. According to Laker (2000) in areas like the Tyhume and Amathole basins soils with extremely poor physical conditions and low fertility are developing from the weathering of the hard plinthite.

Scattered throughout the province high quality soils that are extremely stable against erosion are found in the vicinity of localized dolerite outcrops from which they have developed (D'Huyvetter and Laker, 1985; Laker, 2000).

In the northeastern part of the Eastern Cape (East Pondoland) deep, highly weathered, well-drained soils are found. The contributing factors are ideal climate (high rainfall and relatively high temperatures) and the presence of Ecca or Dwyka Group sediments as parent material (Laker, 2000).

2.2.3 Natural vegetation

Vegetation is the product of climate and soil (De Wet and Van Averbeke, 1995). This means that under a combination of ideal climate for growth and good soils, the vegetation will flourish and protect the soil. However, should one or both of the two factors not favour vegetation growth, the possibility is that the vegetation cover will be less, thus exposing the soil to the rainstorms and erosion.

According to De Wet and Van Averbeke (1995) Coastal Forest, Dune Thicket and Fynbos communities are found in the humid eastern parts of the province. In the dry western interior shrub-like Karoo, Spekboomveld and false Karoo vegetation occur.

In the arid river valleys, Valley Bushveld is the dominant vegetation (De Wet and Van Averbeke, 1995).

De Wet and Van Averbeke (1995) describe the vegetation in the central semi-arid and sub-humid areas as dominated by *Acacia* Savanna, Dune Thicket, Coastal Mixed grassveld, False Thornveld Grassland, False upper Karoo and Spekboomveld. Dohne Sourveld and Ngongoni occur in humid areas, whilst the Fynbos communities are found in the western part of the province (De Wet and Van Averbeke, 1995).

Afromontane forest occurs in the humid mountain areas, e.g. in the Amathole mountains, the Winterberg mountains, etc.

In grassland areas, sweetveld occurs in sub-humid areas and sourveld (e.g. Dohne sourveld) in higher rainfall areas. The sweetveld is more vulnerable to overgrazing and soil erosion than sourveld. Maps 2.4 and 2.5 show the Acocks veld types and the land cover of the Eastern Cape, respectively. On the land cover map the boundaries of former Transkei are clearly seen from its poor land cover due to overgrazing and over-exploitation. The poor land cover in most of the former Ciskei is also clearly seen. In the latter the boundaries are less clear because a number of well-preserved farms were incorporated into the Ciskei as part of the previous government's homeland consolidation programme.

2.3 DEGREE AND EXTENT OF SOIL EROSION IN THE EASTERN CAPE

Soil erosion is frightening and widespread in the Eastern Cape and has resulted in loss of thousands of hectares of land from production and tons of valuable topsoil. Water erosion is the biggest environmental and agricultural problem in the province. Soil erosion has resulted in closing down of "planned" irrigation schemes in the region and the abandonment of many cultivated areas. Widespread soil erosion has resulted in the silting up of dams, thus reducing the storage capacity of the dams. Plate 2.1 clearly shows the impact of soil erosion in the catchment of the Lubisi dam in the form of virtually total silting up of the Lanti weir.

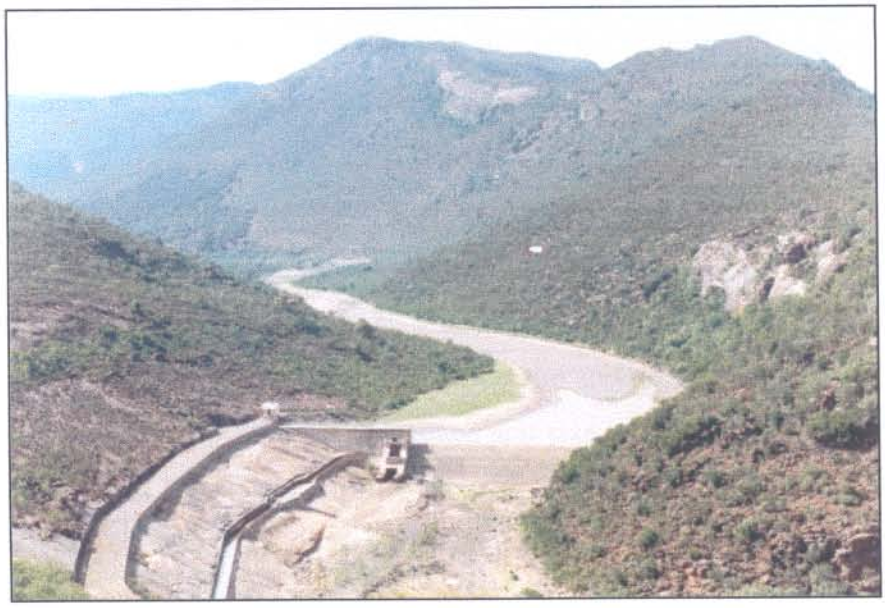


Plate 2.1 – Silted up Lanti weir (Photograph: Tracor, 1984)

The main contributing factors to the alarming rate of soil erosion in the Eastern Cape province are discussed in detail in Section 2.4.

2.4 CAUSES OF SOIL EROSION IN THE EASTERN CAPE

The exploitation and consumption of the natural resources are directly related to population pressures, meaning that even though the environment is extremely vulnerable, farming takes place even in sensitive areas leading to severe damage to the rather fragile resources. (Refer to section 2.2 for details.)

Low and erratic rainfall means that large areas of the province are arid and semi-arid, and unsuitable for agriculture. Farming takes place even in sensitive areas, leading to severe damage to fragile resources.

2.4.1 Climate and vegetation

Rainfall is one of the most important factors determining the degree of water erosion found in an area. Various aspects of rainfall, including amount, storm intensity and reliability, are important in this regard. On the one hand rainfall has direct effects on soil erosion, related to the erosivity of the rain and/or through the amount of runoff generated by intense storms.

On the other hand it also has indirect effects through its influence on the vegetative cover and on pedogenesis (soil formation and development).

As was indicated in Section 2.3, the rainfall of the Eastern Cape is in most areas characterized by very aggressive thunderstorms. This means that they have a very high-energy flux (Bloem, 1992). According to Lal (1994) rainfall erosivisity is the ability of the rain to detach and transport the soil as a result of raindrop impact and runoff generated by rainfall. The shape and size of the raindrop plays a major role in detaching and transportation of soil particles. In the Eastern Cape, even where the rainfall is low it is very erosive. The thunderstorms have high raindrop impact, which splashes soil particles apart. As a result of the aggressiveness of the thunderstorms, water does not infiltrate the soil, thus rainfall intensity exceeds the infiltration capacity of the soil, hence resulting in a high rate of runoff and the soil is washed away. The rate at which the soil is lost, is always accelerated by poor vegetation cover.

Low, unreliable and variable rainfall results in poor vegetation cover. Poor vegetation cover exposes the soil to the disastrous effects of soil erosion. More than two thirds of the Eastern Cape is dry. Long droughts with very dry and hot winds (berg winds) always aggravate the situation. These prolonged dry spells are always followed by torrential thunderstorms that are very erosive and devastate the soil left bare after the drought. In Transkei large areas were devastated when the prolonged droughts of the 1930's were followed by torrential rains and strong winds (Marais and Drewes, 1962). These effects seem to be most severe in the range where rainfall decreases from about 700 to 500 mm mean annual rainfall (Laker, 1990).

Low rainfall also leads to less pedogenesis, thus giving shallow and/or unstable soils, which are more vulnerable to erosion (D'Huyvetter and Laker, 1985), and also gives poor vegetative cover.

In a study in the central parts of the former Ciskei, Weaver (1988) obtained the "anomalous" result that erosion was less the higher the erosivity of the rain was. It was, in fact, not anomalous but one has to understand the balance between increased erosivity in the higher rainfall areas and on the one hand and the more dense and

stable vegetative cover and deeper and more stable soils given by the higher rainfall on the other hand, with the latter overriding the former in this case (Laker, 1990).

2.4.2 Soils

The Eastern Cape is dominated by poor quality, highly erodable soils (Laker, 2000). This is especially true for the western and southern parts with less than 700 mm mean annual rainfall, becoming worse as the rainfall decreases. The contribution of the soils to soil erosion is evident in the Herschel area, the southwestern parts of the former Transkei and various other areas where poor soils result from mudstones. Such soils are characterized by shallow sandy topsoil and impermeable unstable heavy clay subsoil, e.g. Sterkspruit and Estcourt forms. Such soils are unstable and are washed away very easily. Shallow soils with low water storage capacity, also become saturated with water very quickly and water is lost as run off which takes off the topsoil with it (D' Huyvetter and Laker, 1985).

Other factors that contribute to the erodibility of the Eastern Cape soils are the very low organic matter content, which resulted from poor farming practices, and erosion of the topsoil that has exposed the unstable subsoil.

Parent material has a very big influence on the stability of the soil against erosion. Very stable soils develop from dolerite, but unfortunately dolerite (and consequently also the soils developed from it) cover only small isolated areas throughout the province. In the northeastern part of the province (East Pondoland) a combination of Ecca and Dwyka sediments and high rainfall has led to the formation of high potential stable soils. On the other hand soils derived from mudstone and shale of the Beaufort Group, especially the purple/red mudstones of the Elliot Formation and Tarkastad Subgroup, are very unstable and highly erodable.

2.4.3 Topography

Four topographical features are important in regard to soil erosion, namely

- Slope steepness
- Slope length
- Slope form (plane, convex or concave)
- Slope aspect (i.e. the direction in which the slope faces)

Steep land is more sensitive to water erosion than flat land, if all other factors are constant (Hudson, 1971). On steep slopes the velocity of runoff is higher than on flatter slopes, thus increasing detachment and sediment carrying capacity of the runoff water. Because there is on steep slopes also less opportunity for infiltration, it leads to a higher runoff volume. On long slopes, especially if they are relatively steep, there is a progressive build up of both volume and velocity of water and more soil is washed away (D'Huyvetter and Laker, 1985). The extent of soil erosion on identical slopes differs much, however, and depends on the inherent stability of the soil against erosion, which is determined by factors such as parent material and climate (Sections 2.4.1 and 2.4.2). In the former KwaZulu, Liggitt and Fincham (1989) found that the most serous erosion, especially in the case of gully (donga) erosion, is mostly not found on the relatively steep middle and upper slopes in the landscape, but on the flatter lower slopes. In individual cases this is due to one or more of the following:

- The large volumes and high velocity of the water running onto these areas from steep upper slopes.
- More cultivation on the flat lower slopes.
- Inherently more unstable soils on the lower slopes.

Scenarios similar to that described by Liggitt and Fincham (1989) are common in the Eastern Cape also. A general feature in areas like Middledrift (Section 3.2) and Madliki (Chapter 4) in the former Ciskei is consequently that gullies start from the valley bottoms or foot slopes and eat their way upslope and, therefore, more erosion is visible on the valley bottoms and foot slopes. All three factors listed above contribute equally towards this situation.

In the Sterkspruit/ Herschel area of the former Transkei extremely severe gully erosion is found in the lowlands, while the high mountains are much more stable (Section 3.3). In the neighbouring Lesotho an identical scenario is found. In these cases the differences in degree of erosion are related to differences in parent material and rainfall and not primarily slope features.

In the high mountains the rainfall is high and the parent material is basalt, a combination conducive to the development of stable soils and a good vegetative cover. In the lowlands the rainfall is much lower and the parent material is purple mudstones of the Elliott Formation (previously known as the notorious "red beds"), a combination producing extremely unstable, highly erodable soils.

According to Hudson (1971) more soil is lost on plane slopes than on concave slopes, but less than on convex slopes. This generalization is normally true for natural erosion, but for human–induced soil erosion, especially under the injudicious cultivation, the reverse is usually true (D'Huyvetter and Laker, 1985). In the latter case the most severe erosion is on concave slopes, because (a) the concave slopes are usually the lower slopes in the landscape, thus receiving larger volumes of run-on water from higher slopes, (b) water is concentrated into higher volumes on such slopes because of the shape of the slopes and (c) the soils on the concave slopes are usually the least stable soils.

In the southern hemisphere slopes with northern aspects are hotter and drier, with shallower soils and sparser vegetation. To a somewhat lesser extent this also applies to the western slopes. Because the soils on these slopes are less leached the vegetation on them is more palatable, causing animals to concentrate more on them. They also warm up earlier in spring, causing the grass to start growing earlier than on cooler southern slopes. Both these factors promote overgrazing of the northern and western slopes. This means that the northern and western aspects are more vulnerable to erosion.

During the drought of the 1980's overgrazing and erosion of the northern slopes became severe in Lesotho, for example, while the southern slopes suffered much less erosion.

2.4.4 Population pressure and land tenure

"A rapidly increasing population, in the context of slow economic growth and inadequate development, could lead to even more rapid deterioration of the environment in the 1990's" (Ramphele and McDonald, 1991; citing Charles Simkin).

The demand for firewood, building materials, grazing and browsing by livestock, clearing for cultivation, i.e. deforestation, highlighted the role of the human factor as a catalyst in resource degradation in Africa (IFAD, 1992). Complete harvesting of the vegetation without planting back or replacement, that is, outstripping the capacity of natural generation, has exposed the vulnerable soil to the erosivity of raindrops or rain splash and eventually to soil erosion.

According to De Wet and Van Averbeke (1995) the pressure on land in the Eastern Cape is acute, and land is the most important resource for survival in the province.

In essence high ***population pressures*** on the fragile resources of the Eastern Cape has resulted in unsustainable utilization or overexploitation of the resources. In view of this soil erosion has gained territory in the province, especially in the areas which are vulnerable because of unfavourable soils and climate.

It should be kept in mind that "population pressure" and "population density" is not synonymous, since the "pressure" is a function of the ***human*** carrying capacity of an area. Many areas in the world with relatively low population densities are "over-populated", because the population is outstripping the low human carrying capacities of those areas (Knox, 1981). In his study in the central parts of the former Ciskei (now the central Eastern Cape), Weaver (1988) found no correlation between population density and degree of erosion. This is not surprising. On the one hand his study included high potential areas (high rainfall; stable soils), which could tolerate high population densities without being degraded. On the other hand it also included low potential areas (low rainfall; unstable soils), where even relatively low population densities could be in excess of the human carrying capacity, thus causing serious erosion.

In view of lack of alternative viable and affordable energy sources and construction material in the rural areas it may be unfair to criticize the local population too harshly for the overexploitation of their vegetative resources. Overexploitation of valuable species can be criticized, however.

Ignorance and lack of respect for natural vegetation as well as land has resulted in people cutting even yellow wood and olive trees for poles though they are aware of the importance and value of these tree species.

There is also an increase in the number of informal settlements throughout the province. This on its own is a threat to the limited natural resources. Some of these unplanned developments are initiated on prime agricultural land, steep areas, and forested land. Once people are settled in an area, they start impacting negatively on the environment through their basic survival activities like cultivating virgin land, thus making the soil more vulnerable to erosion. For an example, the impact of indigenous forest invasion near Port St Johns has resulted in landslides and erosion of the invaded area.

Land tenure systems also impact on land degradation. In large areas of the province the land tenure system is still the old traditional one, whereby individual families are allocated arable land by the chief or headman. Re-allocation of land took place during the introduction of the betterment schemes. (Refer to Section 2.4.6.) The grazing land is communal, meaning that it is a state land in which everyone in the community has equal access to rangeland. However, this type of land tenure has its limitations due to insecurity that goes with it and this results in reluctance from the community to invest in looking after the land, instead people end up overexploiting it. De Wet and Van Averbeke (1995) pointed out that before the change of government in South Africa in 1994, over 80% of the high potential land in the Eastern Cape province was already in the hands of traditional Black small-scale farmers. Yet, the average maize production in the former Transkei was only 0,5 t/ha and in the former Ciskei 0,2 t/ha, a situation that could largely be related to the traditional land tenure system. IFAD (1992) stated that solving of the land tenure system is one of the greatest challenges in Africa.

They point out that the present traditional system leads to under-utilization of high potential land, leading to unbearable pressure on marginal land and its degradation.

2.4.5 Overgrazing and uncontrolled veld fires

Overgrazing is the main problem causing soil erosion in most parts of the Eastern Cape province. Veld fires are the norm in all parts of the province, especially in winter. Both overgrazing and uncontrolled veld fires result in the removal of vegetation, which in turn results in rainwater running off instead of seeping into the ground. Indiscriminate bush-clearing by burning strips the land bare and leaves it highly susceptible to both water and wind erosion. Brush fires have been identified as the main cause of ground cover annihilation (Ouattara, Robinson, Morna, Ajayi, Anza, and Wainaina, 1993). Judicious burning is essential to maintain many types of veld in good condition. However, injudicious burning for the wrong reason is harmful. Ouattara *et al* (1993) stress that the elimination of vegetation and litter has a catastrophic effect on protection of soil against erosive rainfall and prevents the build up of protective organic matter. Undue trampling by livestock in overstocked areas results in bare areas and footpaths from which soil erosion starts. (Plate2.2, foreground). The situation is aggravated where surface sealing of the bare patches occurs (Plate 2.3).

Plate 2.2 – Sheet and gully erosion in overgrazed area (foreground) in former Transkei. (Photograph: Tracor, 1984)

Plate 2.3 – Bare patches with severe surface sealing due to overgrazing in former Transkei (Photograph: Tracor, 1984)

Overstocking or overgrazing is more serious in the sweetveld (low rainfall areas), becoming lesser in mixed veld and sourveld (Trollope and Coetzee, 1975). According to Trollope and Coetzee (1975) incorrect land use aggravates the problem where the grazing capacity of cultivated areas is incorrectly assumed to be equal to that of the veld, ignoring the low levels of crop residue being available due to recurring crop failures.

Overstocking is a very difficult problem to address, taking into account the traditional customs of the communities involved in the communal grazing system. In the case of traditional customs like *lobola* cattle are changing hands quite often and it is not easy (if not impossible) to sell cattle acquired through *lobola* as they have a traditional meaning to the family. Another complication in the traditional system is that cattle plays a very important role in the Xhosa culture, as men "imitate" the stature of the horns of their cattle when they are dancing in traditional ceremonies. Cattle are everything (wealth) in the Xhosa tradition. In terms of this, it is impossible to control or reduce livestock numbers in the traditional farming areas. Communal grazing or land tenure also has its complications as no one is really taking care of the land.

Another contributing factor is the "open veld system" as there are no camps at all, animals roaming around the veld without control throughout the year. Selective grazing by sheep also contributes to degradation of the species composition of the

veld. Where camp systems are in place, there is often over-utilization of "home camps", because animals are kept there more than in "away camps" because of problems with vermin and theft (Trollope and Coetzee, 1978). Trollope and Coetzee (1978) also indicated the negative impacts resulting from localized trampling and cattle tracks, leading to erosion, associated with night kraaling of livestock.

Bush encroachment into grassland areas is a major problem in the province (Trollope and Coetzee, 1978). It is a problem in areas where incorrect stock ratios exist, i.e. where the ratio of goats to cattle is too low. Injudicious elimination of burning may also result in bush encroachment (Trollope and Coetzee, 1978). Bush encroachment limits the carrying capacity of veld. Replacement of a dense grass sward by trees aggravates soil erosion, because the full ground cover and dense root system of grass protects and stabilizes the soil against erosion (Plate 2.4).

Plate 2.4 – Sheet and gully erosion due to overgrazing of sweetveld grassland and bush encroachment caused by injudicious elimination of goats and burning in former Ciskei. (Photograph: J.L.H. Williams)

Furthermore, the types of shrubs and trees involved in bush encroachment and bush densification in the province do not supply thick layers of leaf litter to build up the organic matter in the soil, as is the case under the deciduous forests in Europe, for example.

2.4.6 Betterment / resettlement

The so-called "betterment schemes" of the homeland system entailed the division of each Tribal authority (now called Traditional Authority) area into grazing land, residential land and arable land. Before the introduction of the homeland system in the Eastern Cape, people were scattered throughout and this offered flexibility in land use and therefore, even though over populated, there was less pressure on land resources. After the introduction of the homeland system people were brought closer together and started chopping each and every tree nearby residential areas for firewood and later started doing so in mountains and next to streams, leaving streams running dry.

Reduced use of cow dung as fuel, as cattle were grazing in isolated camps far from the homesteads, became a problem and this resulted in more stress on the natural vegetation. Betterment therefore resulted in less flexible land use and more ignorance without lessening the pressures on land resources (Shibane, Personal communication). Due to inadequate attention to the diversity of soils found in the area and because this was not taken into consideration during the resettlement, some of the worst soil erosion is found in so called "rehabilitated areas."

2.4.7 Incorrect land use recommendations by 'planners'

Soil erosion is widespread and very serious in "betterment schemes" and "rehabilitated areas" throughout the former Ciskei and Transkei. This is due to incorrect land use planning based on incorrect land suitability evaluation by the planners (D'Huyvetter and Laker,1985; Hensley and Laker, 1975, 1978). Due to lack of basic soil science knowledge the planners did not adopt different criteria that suited the inherent different erodibilities of the different types of soils and used a single inappropriate norm (Laker and D'Huyvetter, 1988). Many areas, which were set aside for cultivation by planners, should not have been cultivated and/or irrigated.

Those areas are heavily eroded and many have been abandoned. One of such areas is the Lubisi Dam catchment area, where the planners recommended cultivation and production of sorghum on Sterkspruit soils as indicated by Tracor (1984). See Plates 2.5, 2.6 and 2.7.

Plate 2.5-First signs of rill and gully erosion in an area incorrectly demarcated for cultivation by planners in the former Transkei (Photograph: Tracor, 1984)

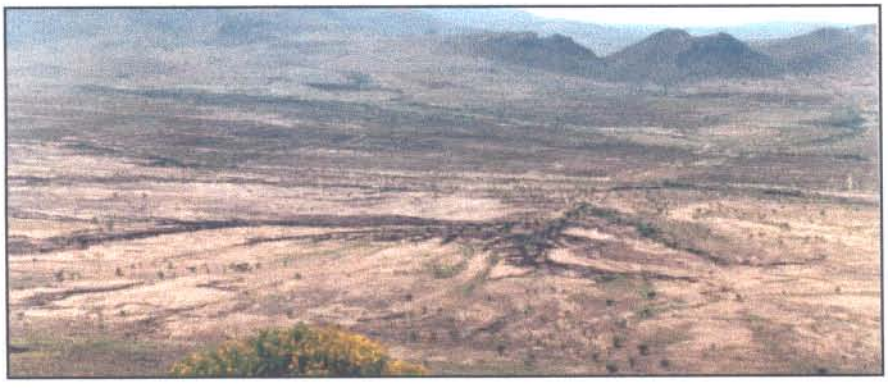


Plate 2.6 – Abandoned severely eroded cultivated field demarcated for cultivation by planners in the former Transkei. (Photograph: Tracor, 1984)

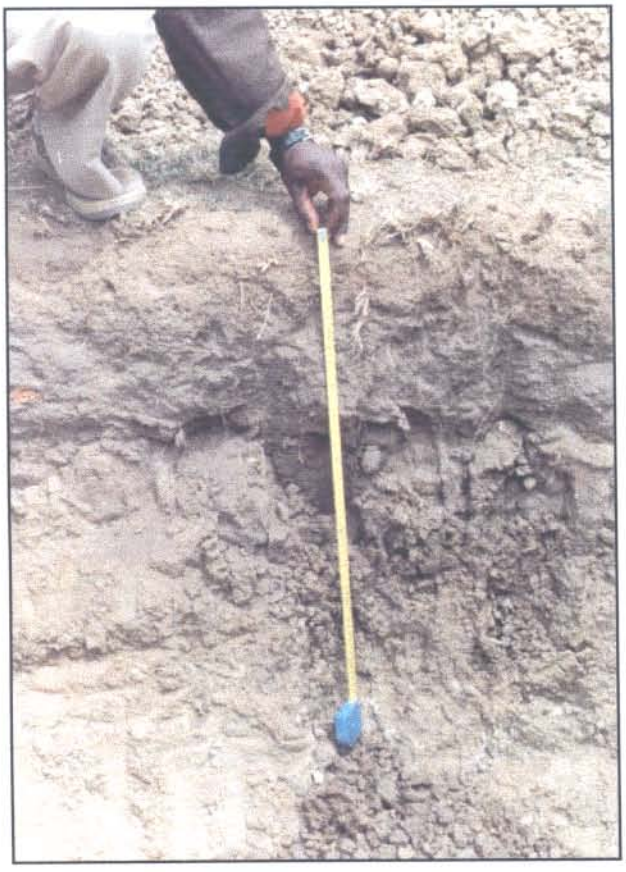


Plate 2.7 – Typical unstable Sterkspruit soil demarcated for cultivation by planners in the fields shown in Plates 2.5 and 2.6. (Photograph: Tracor, 1984)

The Lubisi Dam catchment area, where Plates 2.5, 2.6 and 2.7 were taken was ironically called a " rehabilitated" area. Instead of recovering, its condition deteriorated drastically because of the inappropriate rehabilitation measures and the Lubisi dam is silting up (Tracor, 1984).

A major problem is the low resilience (recovery potential) of the degraded cultivated areas. Laker (2000) gives an example of a degraded, abandoned cultivated area in the former Ciskei, which has not recovered more than 20 years after being abandoned (Plates 2.8 and 2.9). This is again an area that was demarcated for cultivation by planners during the 1960s. It was abandoned during the 1970s. Plate 2.8 was photographed in 1987 and Plate 2.9 in 1997. In both plates the contours are still visible. The important aspect is to look at the areas beside the gully. It is mainly bare patches with some small shrubs. This area used to be covered with excellent dense,

high quality grassland, which is simply not able to return. Plate 2.10 gives an idea of the enormous size of the gully, which developed in the lowest part of this area.

Plate 2.8 – Lack of recovery of abandoned planned cultivated area in Ciskei 10years after being abandoned. (Photograph: J.L.H. Williams)

Plate 2.9 – Lack of recovery of the same area as in Plate 2.8, but now 20 years after being abandoned. *Agave americana* hedges planted in an attempt to arrest further degradation (Photograph: J.L.H. Williams)

Plate 2.10 – Size of the gully in the lowest lying part of the area depicted in Plate 2.9 (Photograph: J.L.H. Williams)

Incorrect soil classification has also in some cases led to incorrect land use recommendations, which in turn led to disasters, such as severe soil erosion and failures of irrigation schemes in the province (Laker, personal communication).