

CHAPTER 1

INTRODUCTION

1.1. BACKGROUND

From the time when people first gathered to live in communities the disposal of waste generated by human activities has been an environmental problem (Tchobanoglous, Theisen & Eliassen, 1977). Towns and settlements were often smelly and unhealthy places, due to the fact that solid and liquid wastes were commonly tipped out into the street. These kinds of disposal practices led to water pollution due to transport of the pollutants to water bodies through runoff or leaching during rains (Try & Price, 1995). Land application of wastes often led to the accumulation of toxic concentrations of various pollutants in soils.

Water is an important though often underrated resource. South Africa is a relatively arid country with an average annual rainfall of less than 500 mm.a^{-1} (DEAT, 1997), compared with the world average of 860 mm.a^{-1} . With this kind of situation water availability and quality are of paramount importance to the socio-economic growth in South Africa (Duncan, Brady & Stoll, 1994). South Africa, especially the Western Cape, has very limited arable land. Degradation of good quality soils, e.g. through pollution, can, therefore, not be afforded.

Wine production is a very important and growing part of South Africa's economy, being of paramount importance to the economy of the Western and Northern Cape. Wine production in South Africa has increased over the past decade and this growth increases pressure on the natural resources such as water, soil and vegetation (Van Schoor, 2000). The wine industry in South Africa comprises a group of closely related industrial operations engaged in the production and processing of grapes to a variety of alcoholic and non-alcoholic products (Robertson & Kirsten, 1993).

The wine industry produces a large quantity of wastewater associated with washing operations during grape harvesting, pressing and the first fermentation phases of wine processing. The problem of handling winery wastewater has been part of winery management for years (Shephard & Grismer, 1997).

The rapid growth in wine production and intensification of land use in most wine making regions of the world during the last decade needs to be matched with greater emphasis on minimizing the impact of winery operations on the natural and human environment (Gajdos, 1998). Wastewater treatment and disposal has become a major component of policymaking because of growing awareness of environmental quality issues (Huruvf, 1998). As a result the disposal of effluent from the wine industry has become an increasing cause for concern to both the industry and the controlling bodies responsible for effluent management (Strohwal, 1993).

Very little monitoring of winery effluent characteristics and impacts on the environment has been done in the past. In South Australia it started only after the Environment Protection Act came into effect in 1995 (Hazell, 1998).

Chapman (1995a) indicated that the South Australian wine industry disposes of its wastewater primarily by evaporation, irrigation, land application and direct discharge into watercourses at times of high flow. Malodours and other problems associated with anaerobic conditions caused by the high organic loading of the wastewater have led to these methods of disposal becoming environmentally and aesthetically unacceptable. Problems associated with anaerobic decomposition are by far not the only problems caused by winery effluents, however. Virtually no systematic studies on the composition and environmental impacts of winery effluents have been conducted in South Africa.

The focus of this dissertation is on land disposal of winery effluents. Ten wineries, distributed throughout the Western and Northern Cape, were included in the study. These wineries use different methods of disposal on different soil types. The study examined the cumulative impacts of the procedures used for disposal of winery effluents on different types of soil in the Western and Northern Cape Provinces.

The compatibility between different disposal methods and different soil types has been determined. These were used to develop guidelines for the selection of suitable disposal method/soil type combinations. It can serve to put acceptable waste management practices in place and indicate policy areas needing improvement or change.

Various other related aspects regarding the disposal of winery effluents and quality are addressed in the multidisciplinary studies at the University of Stellenbosch and the Nietvoorbij campus of the ARC – Institute for Fruit, Vine and Wine.

1.2. PROBLEM FORMULATION AND OBJECTIVE OF THE STUDY

The study followed a multidisciplinary study that started as a result of a lack of information on the disposal practices of winery effluents in South Africa. There is great concern that these effluents may have negative environmental impacts, especially if disposed on soils inappropriately, and that wineries may become liable to heavy penalties enforced by legislation.

Objectives of the study

- ❖ To investigate the environmental impacts of winery effluents applied in different ways on different types of soil.
- ❖ To develop guidelines for the identification and selection of suitable combinations of disposal methods and soil types for land disposal of winery effluents.
- ❖ To propose alternative management practices or strategies which comply with the national and international legislation.

1.3. STRUCTURE OF THE DISSERTATION

A literature review on the environmental impact of winery effluents is presented in Chapter 2. This chapter also includes a review of the production and composition of winery effluents, their characteristics and disposal methods. Chapter 3 outlines the research methodologies used. It describes how the wineries were selected, soil and effluent sampling and also the analytical methods that were used. Chapter 4 gives results and discussions per winery. This is done so that each participating winery can later be given a clear picture of its specific situation. Chapter 5 gives an integrated comparative discussion on the composition of winery effluents. Chapter 6 gives an integrated comparative discussion on the effects of winery effluents on soil and possible pollution of water bodies. Chapter 7 gives a discussion on the fate of the

organic components of winery effluents in soils. Chapter 8 gives conclusions and recommendations.