

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

The study confirmed that winery effluents pose definite pollution problems. A few specific cases of year-round problems were found, e.g. the high sodium levels at Paarl 2 winery, high potassium levels at the Berg River winery and the overall abnormal situation at the Olifants River winery, but in general unacceptable levels of pollutants in winery effluents are a seasonal phenomenon. This is not unexpected, in view of the nature of the enterprise. This means that special management and/or pre-treatment techniques will be required only during specific limited periods of the year.

Apart from the special cases mentioned above, the general pattern is that high levels of the main inorganic pollutants (sodium, phosphorus and potassium) occur just before the winemaking season (December/January) and just after it (March/April). In contrast high levels of organic pollutants (as reflected by high COD levels) occur during the winemaking period, as could be expected. This is a two or three month period during February to April. In a few cases it started in January.

When effluent is irrigated on soils, the biggest problem of winery effluents is the high organic matter levels in the effluents during the winemaking period. Most of the soils do not retain it, neither does it undergo aerobic decomposition in the soil, and it leaches through to the water table at the bottom of the soil profile and from there seeps through to nearby streams or groundwater bodies, thereby polluting the environment. This confirms the high off-site pollution potential of the organic matter.

The off-site pollution hazard of both the organic and inorganic pollutants is aggravated by the fact that disposal is in many cases done on highly leached sandy soils with very low nutrient retention, low water storage capacities, and excessive permeabilities.

In addition large volumes are generally disposed on very small areas, causing major over-irrigation, which aggravates leaching. Some of the disposal areas are also closer than the permissible distance to streams. It is clear that in most cases the wineries did not take cognizance of the warnings and guidelines given in literature.

At most of the wineries effluent management is in most respects very poor. A notable exception is the apparently good acidity management at almost all the wineries. Disposal management is poor, including in most cases poor soil and site selection for disposal. At most wineries these problems will have to be addressed **urgently**, especially to combat off-site pollution. The problem is that many of the wineries have little or no other alternatives available in terms of the quality of soil and area (size) of land available for disposal by means of irrigation of cultivated pastures or ponding, and even the locality of the site. Unfortunately this may mean that they will have to change to disposal on larger areas by irrigating vineyards (or other crops), which Chapman (1994) indicates as the only other option available in many areas, or expensive pre-treatment of effluent before its disposal. The possible use of reed beds to purify effluent is presently being investigated at the ARC Institute for Fruit, Wine and Vine.

In the study it was found that there are many similarities between wineries. But it must be emphasized that there are also major differences between them, such that the situation each winery needs to be investigated separately, its specific problems analyzed and appropriate measures identified to counteract or eliminate these problems.

Guidelines can be given or developed for individual factors, but a single overall recipe cannot be prescribed. Good guidelines are available in the literature and it is really not necessary to develop new ones for most of the factors. A notable exception is the lack of information in the literature on the problems associated with the leaching of the (water-soluble) organic fraction of the winery effluents and its off-site pollution potential. Better guidelines and treatment techniques should be developed for this.

From the study it was clear that deep, highly permeable, sandy soils (especially those with E horizons) are not suitable for disposal of winery effluents, either by means of irrigating pastures or by ponding.

8.2 RECOMMENDATIONS

It is recommended that:

- a. A copy of this dissertation is made available to the managers of each of the 10 wineries that were willing to cooperate in this study. The mistake is often made not to give feedback to the people who cooperated in a study, thus making them unwilling to cooperate again in future.
- b. The code for his/her winery is made known to the manager of each cooperating winery individually and confidentially so that he/she can see what the findings for his/her specific winery was. A discussion session can then be arranged at each winery separately in order to look at weak points and possible solutions for that winery in the form of close consultation with the manager.
- c. A practical semi-popular booklet be compiled, for use by winery managers, giving guidelines and suggestions regarding:
 - i. Management systems to improve effluent quality.
 - ii. Appropriate and sustainable effluent disposal systems.
 - iii. Selection of suitable soils and terrain for effluent disposal.

Guidelines and information from literature, practical knowledge of various persons involved in advising wineries on effluent management and disposal, and information from this study should be used in the compilation of such booklet.

- d. Studies of the situation regarding effluent quality, effluent disposal and disposal site characteristics be made at as many wineries as possible as soon as possible. Effluent quality should be monitored on a monthly basis for at least a six month period from December to May. There is an urgent need to study effluent quality at a selection of wineries also for the period June to November.

Phosphorus **must** be included in the determinations made on effluents. If time, manpower and laboratory facilities are problems, it is recommended that soil sampling is done only once and that this is done in **April**. This should be accompanied by a full profile description. In deep sandy soils studies should be done to at least 2,5 m depth unless a limiting layer is found at a shallower depth.

- e. A study be undertaken urgently to determine how far downstream the organic pollution spread at the Robertson 1 and Stellenbosch wineries and its influence on the aquatic life. This could serve as indicator of the potential impacts of similar situations at other wineries. The situation at the Orange River winery regarding the organic matter accumulation in the deep subsoil should also be investigated.
- f. The apparent regional patterns regarding COD be further investigated and attempts made to identify the reasons for, *inter alia*, (i) the very high COD values found at the Northern Cape wineries and (ii) the relative low COD values for the wineries from the Paarl region.