# CHAPTER 6

## Conclusions and recommendations

The objective of this work was to evaluate the elite breeding lines of flue-cured tobacco for their field and market performance.

The single trial at Rustenburg showed that plant height at topping and whole-plant leaf area could be the most important yield components of the elite breeding lines. The nicotine and reducing sugar concentrations of the elite breeding lines conform to the acceptable levels according to the control, TL33. The smoke flavour and aroma profile of the elite breeding lines may meet the demands of the consumer. The similarity in texture between the elite breeding lines and TL33 might imply that the filling power and the cigarette out-turn of the elite breeding lines may be similar to that of TL33 to the economic benefit of the manufacturer. Non-significant differences existed in yield, quality and income between the elite breeding lines and TL33. These results could not be accurate enough to serve as the basis for meaningful conclusions and recommendations because of the inherent inaccuracy of one trial at a single locality.

More accurate observations of the performance of the elite breeding lines could be obtained when the data from the trial at Rustenburg were combined with the data from other similar trials at Groblersdal, Potgietersrus and Vaalwater in a combined analysis.

The combined analysis demonstrated that ODT92, ODT82, OD2 and OD1 had the potential to produce significantly higher economic yields than TL33 across the localities. ODT82, ODT92 and OD2 would be significantly more economical than TL33. The localities were significantly different. The genotype-locality interaction was non-significant.

Although the IPCA1 was non-significant, the pattern of interaction in the AMMI analysis predicted that ODT82 and ODT92 would be the most economically viable genotypes at Groblersdal, Potgietersrus and Rustenburg. Similarly, ODT92 and OD2 would be the most economical genotypes for Vaalwater. This pattern of interaction seems to be interesting enough to warrant further investigation of the adaptation of the lines over a wider range of environments.

In tobacco, income is dependent on both yield and quality. However, yield dominates the objectives of all plant breeding programs (Stoskopf et al., 1993; and Simmonds, 1987). Therefore, the programmes might not be fully addressing the problems of low producer income to which the low investment in the tobacco industry could be attributed. Dippenaar et al. (1991) suggested that high yields of acceptable quality need to be produced so that a grower may realise high income to meet the production costs and invest more in the business of tobacco production. Therefore, a holistic approach of crop improvement as advocated by Wallace and Yan (1998), where the traits responsible for yield and quality are pursued concurrently, may be worthwhile.

The single trial at Rustenburg alone could not show any differences between the elite breeding lines and TL33. A combined analysis of data from four different localities detected some differences among the entries. These results tended to be in contrast with Greeff's work (1986) on cotton where few trials in a fixed location evaluation system and multiple district trial evaluation system are equally efficient methods of evaluating the performance of cultivars. In tobacco, a satisfactory evaluation of cultivars should involve as many sets of data from as many different localities as possible to eliminate the inaccuracy inherent in one or few trials at a single or few localities.

The ARC-TCRI flue-cured tobacco-breeding programme can be commended for its linkage with the industry. The research-industry linkage enables the researchers to identify the problems of the industry for research action while

keeping the industry well informed about the research developments. Consequently, the proportion of laggards may be small to the benefit of the industry and the national economy.

The ARC-TCRI flue-cured tobacco research programme uses large plot sizes in the evaluation of elite breeding lines. Five ridges with ten plants per ridge allow the collection of many different sets of data from both the destructive and non-destructive sampling procedures without sacrificing the accuracy of results from acceptable sample sizes.

The ARC-TCRI has eleven sites for evaluating elite breeding lines. Such a large number of sites may generate volumes of data that are large enough to collectively detect genotypic differences effectively. However, the non-uniformity of entries in some sites, makes the combined analysis difficult. Data from each site or few sites are analysed separately and conclusions made accordingly. According to the findings of this work, such a programme harbours the inherent inaccuracy of one or few trials at a single or few localities.

This exercise has demonstrated that numerical comparisons of data without restraint by statistical inference procedures may be deceptive. Statistical inferences provide reliable leads to in-depth investigation for refined results that may reveal valuable information necessary for meaningful conclusions and recommendations. Different statistical tools may complement each other in describing genotypic responses to environmental qualities. Eager search for statistical significance may be viewed as statistical pedantry as Greeff (1986) believed, but with proper restraint, it provides a scientific basis for conclusive recommendations.