Summary

Tobacco production is a profitable and job-creating agricultural enterprise. South Africa is the 25th most important tobacco producer in the world.

The problem of the tobacco industry in South Africa is production of low-quality leaf due to unreliable rainfall and poor soils. The low-quality leaf and the activities of the anti-smoking lobby led to the dwindling of local and export markets.

Breeding for high yields of acceptable quality underpins the revival and sustainability of the tobacco industry in South Africa. The objective of this work was to evaluate the elite breeding lines of flue-cured tobacco for their field and market performance.

Eleven elite breeding lines of flue-cured tobacco; OD1, OD2, ODT1, ODT8, ODT19, ODT82, ODT92, ODT100, OD313, OD490 and OD486B were evaluated at the ARC-TCRI in Rustenburg in 1998/1999. TL33 was used as a control. Crop growth duration, photosynthetic competence, plant height at topping, number of leaves per plant, leaf area and yield were investigated as parameters of field performance. The nicotine and reducing sugar concentrations, cured-leaf quality and monetary returns per hectare were investigated as parameters of market performance.

Correlation analyses revealed that plant height at topping and whole-plant leaf area might be the most important yield components of the elite breeding lines.

There were non-significant differences in the marketable yields, nicotine and reducing sugar concentrations, cured leaf quality and market income between the elite breeding lines and TL33.

The non-significant differences could be attributed to either the restricted genetic

advance that is due to the common ancestry and the limited genetic base of *Nicotiana tabacum* or the inherent inaccuracy of one trial at a single locality.

No meaningful conclusions could be made from these findings from one trial at a single locality. Data from three other similar trials at Groblersdal, Potgietersrus and Vaalwater were combined with those from the trial at Rustenburg. A combined analysis was run so that accurate information regarding the performance of the elite breeding lines could be arrived at for meaningful conclusions.

The combined analysis showed that significant differences existed among the localities and among the entries. ODT92 ODT82, OD2 and OD1 produced significantly higher yields than TL33 across the four localities. However, the four elite breeding lines were not significantly different from each other. ODT82, ODT92 and OD2 gave significantly higher market income per hectare than TL33 across the four localities, but the three elite breeding lines were not significantly different from each other. The differences in the performance of the elite breeding lines due to the interaction between the localities and the entries were non-significant.

The Additive Main effects and Multiplicative Interaction (AMMI) analysis was employed to partition the genotype-locality interaction variance for further investigation. The first Interaction Principal Component Analysis (IPCA1) was non-significant. However, the AMMI analysis predicted that ODT82 and ODT92 would be the best-adapted genotypes to Groblersdal, Potgietersrus and Rustenburg in terms of both yields and financial rewards. ODT92 and OD2 were predicted to be the most productive and economically viable genotypes for Vaalwater.

ODT82 and ODT92 were recommended for on-farm trials at Groblersdal, Potgietersrus and Rustenburg, while ODT92 and OD2 were recommended for

on-farm trials at Vaalwater pending their release as commercial flue-cured tobacco cultivars at those respective localities.

A holistic approach to crop improvement, where the traits responsible for high yields and quality are pursued concurrently, may alleviate the problem of low producer income to which the low investment in the tobacco industry could be attributed.

A number of trials at different localities would be recommended to eliminate inherent inaccuracy of single trials at single localities.

Research programmes may need to be open to the opinions from the industry and be flexible to accommodate demands from the industry without losing sight of the objectives of the programmes. It is a requirement to adhere to the scientific procedures of arriving at conclusions to make sound recommendations.