TRB introduces climate-smart tobacco varieties: Expected yield and income increase for Zimbabwean farmers in marginal areas

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Introduction

The Tobacco Research Board (TRB) has developed superior tobacco genetics since the 1950's and these are not grown in Zimbabwe only but well sought after in the region due to their wide adaptability, high yield potential, multi-disease resistance nature, and outstanding quality. To ensure growers continue to derive value from tobacco growing, breeding effort is an ongoing exercise with new genetics being put on the market to counter emerging challenges such as climate change and new pathogen variants.

In an exciting development, TRB announces the release of new tobacco hybrids bred for profitable production in marginal areas (previously excluded from tobacco production). The marginal tobacco growing areas such as Masvingo, Midlands, Matabeleland North,

Gokwe North, Gokwe South and Matabeleland South are characterized by low rainfall, high temperatures, and dry conditions. The occurrence of such weather elements are now also prevalent in some seasons in the traditional tobacco growing districts (characterized as prime). Their occurrences are being attributed to fluctuating seasonal variabilities and climate change. The new genetics are drought-hardy with a fast speed to topping, medium to fast ripening, multi-disease resistance, root knot nematode resistance (double dose), and gives an average yield potential of >2500 kg ha^{-1} under dry and hot conditions. Thus, growers outside the traditional tobacco growing regions will especially benefit from the use of these new genetics. Additionally, growers in the traditional regions may also benefit from use of these genetics as a management tool for double cropping and maximum use of farm resources such as barns. The new tobacco genetics are T78, T79, T80, and T81 (denoted 'T' for trial/test). These are now available on Limited Release Program during the 2023-24 tobacco growing season.

1.2. Climate Change and Tobacco Production in Zimbabwe

Traditionally tobacco production in Zimbabwe was concentrated to the north of the country (Karoi, Doma, Hurungwe, Mhangura etc), central parts of the country (Harare, Beatrice, Mvurwi etc) and to the eastern parts of the country covering Marondera, Rusape and Headlands (**Fig 2A**). Therefore, varieties were developed specifically to cater for these production environments. Climate change-associated shocks coupled with the recent increases in the tobacco grower base in Zimbabwe has seen the crop being grown outside of these traditional areas (**Fig 2B**). These dynamic changes in the tobacco production matrix spurred breeding efforts to explore genetics that can be combined to create a new class of varieties with a fast speed to topping to attain the 18 -19 reapable leaves and guarantee yield. Thus, the genetics have a drought escape mechanism; good management and growing conditions after topping results in accumulation of biomass thus further improving the economic yield.

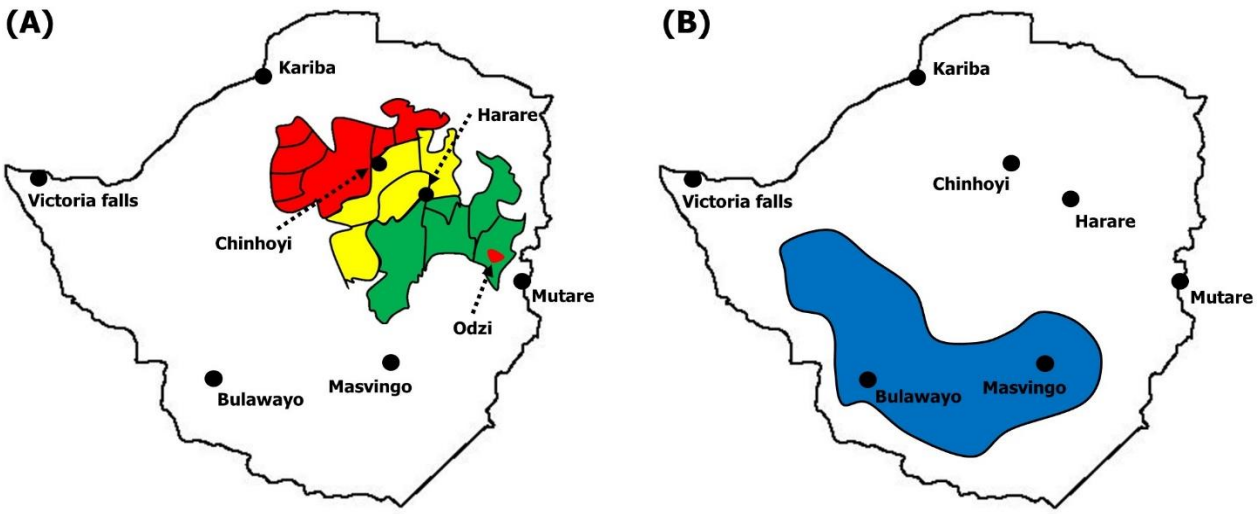

Figure 2 (A&B): Map of Zimbabwe with (A) sample points indicating traditional tobacco producing regions and (B) sample points representing new tobacco growing regions. Red indicates fast-growth, yellow indicates medium growth, green indicates slow-growth, and blue indicates new growing regions.

The new genetics field performance was primarily selected for fast speed to attainment of 18-19 reapable leaves and also proofed to vagaries of weather inclements through selection of key physiological and biochemical parameters. This was done using rigorous gaseous exchange tests employing state-of-the-art Infrared Gas Analyses (IRGA technology **(Fig 3).** This enabled the acquisition of precise physiological measurements of fundamental processes such as photosynthesis, stomatal conductance, transpiration, and intercellular carbon under simulated drought stress conditions to select genotypes that could withstand imposed stresses. Furthermore, additional information on growth habit, root architecture (root volume and root depth), fertilization response, and capacity to recover and provide high leaf yield after extended drought stress periods were used as a criteria. Thus, the newly released genetics' performances are underpinned by rigorous and meticulous scientific tests.

Figure 3: TRB technician using an Infrared Gas Analyzer (IRGA) to take key physiological measurements on the new drought-tolerant tobacco varieties. Photo credit: TRB.

1.4. Characteristics of Limited Release Varieties

Varietal characteristics and attributes for each new variety are highlighted in **Table 1**. The varieties can grow and produce good yields with short rainfall seasons as well as in low rainfall locations. Furthermore, the varieties are multi-disease resistant, fast growing (speed to topping is 6-8 weeks after planting). Although these varieties are fast in growth they considerably slow down after topping allowing accumulation of biomass, uniformly ripen, and mature without putting the farmer under harvesting pressure. Yields of at least 2500 kg ha^{-1} are guaranteed in marginal areas and in a severe drought year. The genetics feature a wide variety of cured leaf styles ranging from lemon to deep orange/mahogany; this allows growers to select varieties that will meet demands of their merchants.

Table 1: Varietal characteristics and attributes for each variety

ETH	Characteristics in Brief
T78	• Yield (2500-3000kg/ha) under hot and dry conditions (drought year) • Very fast growing and fast ripening (topping at 6-8 weeks after planting) • Short, compact plant, • Broad, dark leaves, good top growth • Resistant to 8 diseases including TMV • Lemon – deep lemon cured leaf styles • High Root knot (RK) nematode resistance
T79	• Yield >2500 kg/ha under dry, hot conditions (less rainfall) • Fast to medium ripening (topping at 8 weeks after planting) • Long internodes, pale green • Long pointed leaves • Resistant to 8 diseases including TMV • Bright lemon cures • High Root knot nematode resistance
T80	• Yield >2500kg/ha under severe hot and dry conditions • Medium to fast growing and slow ripening (topping at 8 weeks after planting) • High leaf holding capacity • Tall, very vigorous plant with very big leaves. • Resistant to 8 diseases including TMV • Orange – mahogany cured leaf styles • High Root knot nematode resistance • May be affected by sun scorch under excessive heat
T81	• Yield > 2500-3000kg/ha in a drought year • Quick germination in the seedbed • Very fast growing and fast ripening (topping at 6-8 weeks after planting)

	• Short compact plant with broad, dark leaves • Resistant to 8 diseases including TMV • Deep lemon – orange cures • High Root knot nematode resistance • No flushing at the top

Conclusion

The golden leaf, as it is commonly known, should be cultivated by any willing farmer, regardless of where their farms are located. The development and introduction of varieties appropriate for marginal areas contribute significantly to ensuring that no one and no location is excluded from tobacco production. The release of these new genetics is also in support of the Tobacco Value Chain Transformation Strategy. At this point seed supply is limited to allow a few growers to further test the varieties in their field and the Industry to perform leaf and smoke quality assessments before an application for full Open Release is made. Prospective growers should contact the Tobacco Research Board to access and also learn more about the new genetics.

For more information, contact Kutsaga Research Station's Plant Breeding Division on voip number +263868 800 2604 or Email: tobres@kutsaga.co.zw or visit Kutsaga Research Station.