

***SHELL* Genetic Testing: A Key Enabler of Yield Improvement and Sustainable Palm Oil Production**

RAJINDER SINGH, NUR NADIA KAMIL, LESLIE CHENG-LI OOI, ENG-TI LESLIE
LOW, MEILINA ONG ABDULLAH, RAVIGADEVI SAMBANTHAMURTHI,
NATHAN LAKEY, MOHAMAD ARIF ABD MANAF AND AZMAN ISMAIL

*Sustainable production of palm oil can be boosted by the use of appropriate technological tools to improve productivity within existing acreage. The discovery of the SHELL gene and subsequent development of a diagnostic assay to differentiate oil palm's three fruit forms set the stage for the application of such technological tools by commercial estates prior to planting. The use of DNA-testing can ensure that new planting and re-planting programmes exploit the hybrid vigour expected from selected maternal (*dura*) and paternal (*pisifera*) lines. An expanded nationwide survey of more than a million seeds and seedlings not only confirmed the robustness and scalability of SHELL DNA-testing, but more importantly revealed a 12.8 per cent level of undesired planting material across the Malaysian supply chain, which far exceeds that allowed by the national standard. If SHELL testing had been deployed in the past, the value of crude palm oil (CPO) and crude palm kernel oil (CPKO) production in recent years would have increased by \$1.63 billion USD in 2021 (or \$276/ha/yr), resulting in up to \$2.17 billion per year in increased economic activity (or \$367/ha/yr), and up to \$0.52 billion in additional tax collection by the Malaysian central government (or \$88/ha/yr). Compared to the cost of testing of \$4 per hectare per year, if testing had been done in the past, each dollar spent on testing would have returned \$69.0 in additional production and \$91.8 in economic gains. This indicates that the adoption of DNA-testing to manage the oil palm seed and seedling supply chain is necessary if the industry hopes to increase sustainability, productivity, and profitability in the long-term.*

Keywords: *Sustainable palm oil, SHELL DNA testing, non-tenera contamination, seed testing, supply chain quality.*