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MY SAY: The economic of rubber genome research

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Rubber, which has been synonymous with the Malaysian economy for a very long time, is now being overshadowed by oil palm. Its export earnings, including from rubber wood products, account for less than 5% of national export earnings. This can be enhanced if Malaysia develops superior scientific and technical expertise in the crop through the use of genomic research, discovering novel knowledge to move the industry up the value chain.

Universiti Sains Malaysia took this bold step when it established the Centre for Chemical Biology (CCB@USM) two years ago. It then embarked on whole genome sequencing of the rubber tree in July 2009 and within four months, completed the raw data generation, assembly and annotation of the draft genome.

USM scored a world's first and quickly positioned itself as one of the competitive global centres for genomic research. Today, it has at its disposal a host of intellectual property right (IPR) options on rubber as a new source of wealth for the country's strategic reform initiatives.

In other words, rubber is now positioned as an important commodity to help Malaysia achieve high-income status. To date, the patents for the key discoveries are pending, with potentially many more in the pipeline. The post-genome phase will see even more exciting discoveries in the global rubber industry, making Malaysia a leader among rubber-producing countries again.

With an annual production of about a million tonnes, Malaysia is currently the world's fourth largest producer of rubber after Indonesia,Thailand and India. In 2006, the export earnings of the rubber industry, including heveawood products, stood at RM24.3 billion, accounting for 4.2% of national export earnings. Rubber represents about 23% of cultivated crops in terms of acreage, covering over 1.4 million hectares.

Over a period of 10 years, the consumption of natural rubber has increased 48% from 6.6 million tonnes to 9.7 million tonnes, with yearly consumption increasing from 4% to 6% in the last five years. The trend suggests that natural rubber consumption is rising steadily, leveraging the many superior qualities that the commodity has over synthetic rubber.

CCB@USM, having achieved its initial objective of delivering scientific data on the rubber genome, will advance into the second phase of functional genomics or transferring the fundamental laboratory knowledge to the rubber farmers backed by relevant expertise. Modern plant biotechnology investigations and interventions require genomic data as the starting point to create a competitive advantage using up-to-date competences in current genomic and bioinformatics techniques.

However, speed is of the essence because breeding by modern biotechnology means utilising genomic data to allow the faster development of rubber trees with favourable traits — disease resistance and high quality rubber wood. In fact, whether it is classical, organic or modern biotechnology, genomic knowledge can greatly facilitate the development of markers that are required in the breeding of rubber trees.

To be sure, in less than 24 months, CCB@USM has been able to apply its seamless genome-based discovery platform, combining three next-generation high-throughput genome sequencing technologies with the full transcriptome to construct the first-ever draft rubber genome in the world. In addition, it has completed the identification and validation of genes and encoded proteins of rubber production, and identified all proteins performing enzymatic steps necessary for the production of rubber in Hevea brasiliensis, including rubber polymerase.

Another significant discovery is the identification of all genes and their encoded proteins related to Hevea lignin, making it possible to "design" the production of plant biomass with expected lignin content. Above all, CCB@USM has completed the identification, structural and functional annotation of disease-resistant genes that have wider implications for increasing the quality and yield of the economic crop.

Without doubt, the rubber functional genomics developed thus far have the potential of being a National Key Result Area in ensuring that our competitive edge in the rubber industry is rapidly advanced, simultaneously reversing the seemingly diminishing economic advantages that once drove the country's reputation and

prosperity.

In line with the national agenda, the main benefits accrued thus far from the work of CCB@USM are at least threefold. First, the new knowledge data mined from the genomic database allows Malaysia to move rubber biotechnology into strategic directions like never before.

Second, the rubber genome sequencing project has made it possible to discover key information from the rubber genome that will make Malaysia the choice R&D centre for rubber research once again. Lastly, this will enable the much-needed homegrown human talents and highly specialised human capital to maintain their lead in the emerging areas of genomics and bioinformatics, transforming the national economy and the well-being of Malaysians through the rubber industry.

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