



Science that Helps Agriculture and Small Farmers

Qarbotech has transformed a discovery from a Malaysian university into agricultural technology that unlocks nature's own photosynthetic potential, helping farmers worldwide grow more with less.



The Qarbotech team bringing Malaysian university research from the laboratory into commercial agricultural applications.

From the University Laboratory to the Paddy Field

At Universiti Putra Malaysia (UPM), Prof. Ir. Ts. Dr. Suraya Abdul Rashid, a chemical engineer and nanotechnologist, spent nearly a decade studying carbon nanomaterials. Around 2016, she found that carbon quantum dots, particles measuring just a few nanometres across, could significantly enhance photosynthesis in plants. Collaborators were excited by the potential, describing it as an unprecedented improvement in photosynthetic efficiency. Suraya patented the technology, secured a market validation grant from UPM, and tested the product with neighbours, gathering testimonials and field data. Encouraging results prompted action from Dr. Suraya. In 2018, she incorporated Qarbotech, bringing both the intellectual property and the scientific authority to stand behind the claims the company would make.

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¹ Interview with Qarbotech team

The Challenge

Malaysia's Farming Crisis and the B40 Smallholder

Dr. Suraya spent three years building Qarbotech independently before being joined by Chee Hoe Chor as CEO in 2021 and Amirul Merican as COO in 2024. Dr. Suraya remained as Chief Scientist to dedicate more time to the refinement of Qarbotech's products.

Success did not come quickly. Early pilot sites in vegetable farms were disrupted by flooding, which yielded inconsistent data, while the home gardening segment proved too narrow. By late 2022, the company had nearly exhausted its runway, until a timely angel investment in January 2023 extended Qarbotech's operations. From there, momentum began to build: angel investment secured in early 2023 gave the team room to continue pilot work, acceptance into PETRONAS' FutureTech accelerator programme further sharpened their commercial direction and investment from 500 Global through 500 Southeast Asia Fund III later that year accelerated both growth and market reach. In 2024, Qarbotech raised another round which enabled them to complete an IP buyout from UPM and scale production 50 times with a manufacturing facility in Puchong.

Today, Qarbotech's main product, QarboGrow, is used by smallholders across Peninsular Malaysia. Paddy farmers in Penang and Selangor, chilli and vegetable growers in Kedah and Johor, and melon cultivators in Perlis and Terengganu have adopted the spray as part of their seasonal practice, a reach that culminated in 2025, when Qarbotech secured its first state-level government contract, delivering QarboGrow to close to 1,000 rice farmers across 2,000 hectares of paddy fields in Penang¹.



I was very encouraged by the market validation of my discovery. I always wanted to commercialise my research work so that it can benefit society."

Dr. Suraya Abdul Rashid
Founder and Chief Scientist, Qarbotech

Malaysia imports approximately 40%² of its rice, leaving the country exposed to global supply disruptions and price volatility. To mitigate the risk of shortages, the Thirteenth Malaysia Plan set a target of 80% rice self-sufficiency³. This goal requires meaningful productivity gains from a farming base that has until now, only delivered incremental improvement.

The weight of that challenge falls disproportionately on Malaysia's estimated 200,000⁴ paddy farming households. The majority are rural Bumiputera smallholders, operating on fragmented landholdings in states such as Kedah, Penang, Perak, and Selangor. These farmers face compounding pressures: ageing farming populations, youth migration to urban centres, rising input costs, and increasingly erratic weather driven by climate change. Many belong to the B40 income bracket, meaning that a single poor season could lead to a potential financial crisis.

The deeper challenge, however, is biological. Under optimal conditions, a plant captures only one to 2%⁵ of available light during photosynthesis, the core engine of crop growth. When the monsoon season arrives, cloud cover reduces that capacity further. "Towards the end of the year when it rains a lot, crop productivity falls because of insufficient sunlight," explained Chee Hoe. As Malaysia's monsoon seasons become more intense and less predictable in their timing, periods of reduced light increase. For smallholder farmers who calibrate their planting schedules around seasonal patterns, the unpredictability adds another layer of risk to each growing cycle. Malaysian farmers routinely face yield drops of 30% to 40% during these months alone⁶, with limited means to buffer for the loss.

Conventional responses by way of chemical fertilisers, pesticides, and growth inputs can partially offset yield losses, but their sustained use carries environmental consequences: soil degradation, water contamination, and the gradual erosion of biodiversity in communities that already operate close to the margins. Smallholders, who typically apply these inputs without formal agronomic guidance, bear both the financial burden of purchasing them and the ecological cost of their cumulative use.

² Department of Statistics Malaysia, Malaysia Agricultural Census 2024: Final Report (Putrajaya: Department of Statistics Malaysia, 2024).

³ Thirteenth Malaysia Plan, 2026-2030

⁴ Khazanah Research Institute, The Status of the Paddy and Rice Industry in Malaysia (Kuala Lumpur: Khazanah Research Institute, 2019)

⁵ Elaine Watson, "Qarbotech Turbocharges Photosynthesis with Carbon Quantum Dots: 'We're Kind of Cheating the Plant to Capture More Light'", AgFunderNews, October 28, 2024, <https://agfundernews.com/qarbotech-turbocharges-photosynthesis-with-carbon-quantum-dots-were-kind-of-cheating-the-plant-to-capture-more-light>.

⁶ "We Harness Light To Enrich Lives" - Agritech Startup Qarbotech, MRANTI, December 30, 2023, <https://mranti.my/happenings/news/we-harness-light-to-enrich-lives-agritech-startup-qarbotech>.

The Solution

Carbon Quantum Dots and the QarboGrow Proposition

QarboGrow is Qarbotech's commercial application of Dr. Suraya's patented carbon quantum dot technology. Applied as a foliar spray directly onto plant leaves, it enhances photosynthetic efficiency by helping plants capture a broader spectrum of light and convert it into energy more effectively than natural light alone. The practical result is accelerated growth, higher yield, and stronger resilience to climate stress.

Farmers using QarboGrow can maintain crop production even during seasons where sunlight coverage is low, prolonged or erratic. For households whose livelihoods depend on each harvest, buffering against poor light conditions carries direct economic weight.

The yield improvements documented across Qarbotech's field trials are substantial. The company reports increases of between 30 and 60 percent⁷ across tested crops, with a return on investment estimated at approximately USD5 for every USD1 spent⁵. For rice farmers, the improvement is significant, around 20 percent⁸, or the equivalent of one additional tonne per hectare on an average farm. QarboGrow also improves produce quality. For fruiting vegetables and soft fruits, farmers have recorded higher sweetness, better colour, and more uniform size, factors that strengthen their position in the market.

These outcomes are reflected in documented farmer experiences. In Kedah, Mr. Adib observed that his chilli plants became notably stronger and more resistant to stress. In Selangor, Mr. Syazwan recorded visible improvements in the quality and consistency of his vegetable crops.

My harvest went from four to eight tonnes per hectare. I didn't change anything else, just added QarboGrow - Zul a paddy farmer

⁷ Ananya Bhattacharya, "Malaysian Agritech Qarbotech Raises USD1.5 million to Expand Photosynthesis-Boosting Crop Solution," Green Queen, September 26, 2024, <https://www.greenqueen.com.hk/qarbotech-photosynthesis-enhancer-qarboGrow-climate-funding/>.

⁸ "Penang Launches High-impact Rice Farming Project Using QarboGrow Technology," BERNAMA, October 1, 2025, <https://bernama.com/en/news.php?id=2473492>.

⁹ Elaine Watson, "Qarbotech Turbocharges Photosynthesis with Carbon Quantum Dots: 'We're Kind of Cheating the Plant to Capture More Light'," AgFunderNews, October 28, 2024, <https://agfundernews.com/qarbotech-turbocharges-photosynthesis-with-carbon-quantum-dots-were-kind-of-cheating-the-plant-to-capture-more-light>.

Impact to Date *(as of early 2026)*

Revenue

RM110,000 (2022) to RM1 million (2024)

RM3.8 million 2025 (Unaudited)



Core Product

QarboGrow, a carbon quantum dot foliar spray;
30 - 60% yield increase



USD5 return per USD1 spent

Production

2,000L per month (2022) to 20,000L per month (2024)



100,000L per month (2026 target)

Team

30 employees



2025 Milestone

1st Malaysian company accepted into Breakthrough Energy Fellows (backed by Bill Gates's Breakthrough Energy initiative)



I think our growth will be a lot slower without Dana Impak's investment and support. If we need to achieve our current progress, we need to spend maybe another two years."

Chee Hoe Chor
Co-Founder and CEO, Qarbotech

QarboGrow is non-toxic, biocompatible, and food-safe, reducing farmers' traditional reliance on chemical fertilisers by 10-30%⁹. It can be applied without the risks associated with conventional agricultural products. Without the risk of chemical accumulation or residue that degrade soil productivity, the use of QarboGrow is a superior alternative that supports long-term soil health, giving farmers greater confidence in the quality and safety of the produce they bring to market.

In addition to improving crop yield, QarboGrow also contributes positively to climate action. Treated crops photosynthesise more, pulling more carbon dioxide out of the air. Farmers also need less chemical fertiliser, cutting the emissions produced when fertiliser is both manufactured and applied to fields.

How Investment Helped Catalysing the Commercialisation Leap

Qarbotech's growth journey reflects the relay race of capital and support that young Malaysian companies often need to move from scientific discovery to commercial scale.

The company's connection to Khazanah, via Dana Impak, came through two complementary channels. The first was through the Khazanah Impact Innovation Challenge (KIIC) in 2023, where Qarbotech was recognised as one of the top finalists and was awarded a non-equity innovation grant. The second was through Khazanah's mobilisation of venture capital through partners such as 500 Global, which invested in Qarbotech through 500 Southeast Asia Fund III. Together, these forms of support came at an important stage of Qarbotech's development. The company had narrowly avoided closure in late 2022 and was in the process of rebuilding its operational foundation. The KIIC grant provided both the financial support and institutional credibility that the company needed to continue scaling.

The KIIC grant was used to strengthen Qarbotech's technical capabilities, and hire a team of approximately ten agronomists, drawn largely from fresh biotechnology and agronomy graduates of Malaysian universities. In doing so, Qarbotech created skilled employment for local talent who typically face limited job opportunities within their field.

They were deployed on pilot validation and systematic data collection across Qarbotech's growing network of field sites to expand the scientific evidence base underpinning QarboGrow. All ten agronomists have remained with the company beyond the grant period, strengthening the ecosystem of scientific talent from which the company itself emerged.

Beyond grant funding and investments, Dana Impak's wider platform connected Qarbotech to a broader ecosystem. The company was invited to participate in roadshows where it presented its technology to broader audiences. These engagements generated direct sales and introduced Qarbotech to sustainability-focused partners that have contributed to its business network.

Taken together, Qarbotech's journey illustrates how different forms of capital and support can play different roles at different stages. Grant funding helped extend the company's technical runway. Venture capital helped support growth and market expansion. Since receiving Khazanah's support, Qarbotech's revenue has grown approximately tenfold over the past three years. Production capacity has expanded from 2,000 litres per month to 20,000 litres per month, with a target of 100,000 litres per month¹⁰.

Looking Ahead From Malaysia to the World

Within Malaysia, substantial opportunity remains. The national rice self-sufficiency target of 75% cannot be met without meaningful productivity gains, and Qarbotech's demonstrated yield gains position QarboGrow to contribute to this cause.

Beyond Malaysia, the company has already begun to scale. In 2024, QarboGrow was commercialised in Indonesia, Thailand, and China, with market entry into the United States underway. The immediate priority is deepening reach among smallholder farming communities across these markets, where tropical growing conditions, resource-constrained farmers, and increasing climate volatility make the technology directly applicable.

The company is also looking beyond agriculture. Carbon quantum dots have established applications in photovoltaic devices, sensors, and polymer materials. Dr. Suraya currently leads a team of three scientists working on new application domains, and Qarbotech has begun exploratory work with Japanese research and industry partners in these areas. As she notes, agriculture was the most accessible entry point for the technology. However, the underlying material has a broader range of potential use cases that the company plans to pursue as its R&D capacity grows.

In 2025, Qarbotech became the first Malaysian company accepted into the Breakthrough Energy Fellows programme, a fellowship backed by Bill Gates's Breakthrough Energy initiative and focused on scaling climate-relevant technologies. Qarbotech has also been awarded the Grand Prize at the SusHi Tech Challenge 2026, securing the honour among more than 800 global startup applicants at one of Asia's most competitive innovation platforms. These recognitions place Qarbotech in a global cohort of companies addressing climate and food system challenges.



¹⁰ "Malaysia's Qarbotech to Boost Production Capacity of Photosynthesis Enhancer," The Sun, <https://thesun.my/business-news/malaysia-s-qarbotech-to-boost-production-capacity>.



For more information, visit
www.qarbotech.com