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Seeds: The Foundation of Food Security

From global markets to Malaysia's import dependency — here's what you need to know about seeds and why they matter more than ever.

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GLOBAL MARKET

A Billion-Dollar Industry

\$8.9B

Market Value 2025

Global vegetable seed market valuation

\$14.27B

Projected by 2034

Expected market growth trajectory

Strategic Regional Importance

Seeds are one of the most critical agricultural inputs. The global vegetable seed market is divided into five main regions: North America, Latin America, the Middle East and Africa, **Asia Pacific**, and Europe.

As a key player in the Asia Pacific, Malaysia faces unique challenges with high import dependency on these vital agricultural foundations.



Driving growth through innovation and local cultivation strategies.

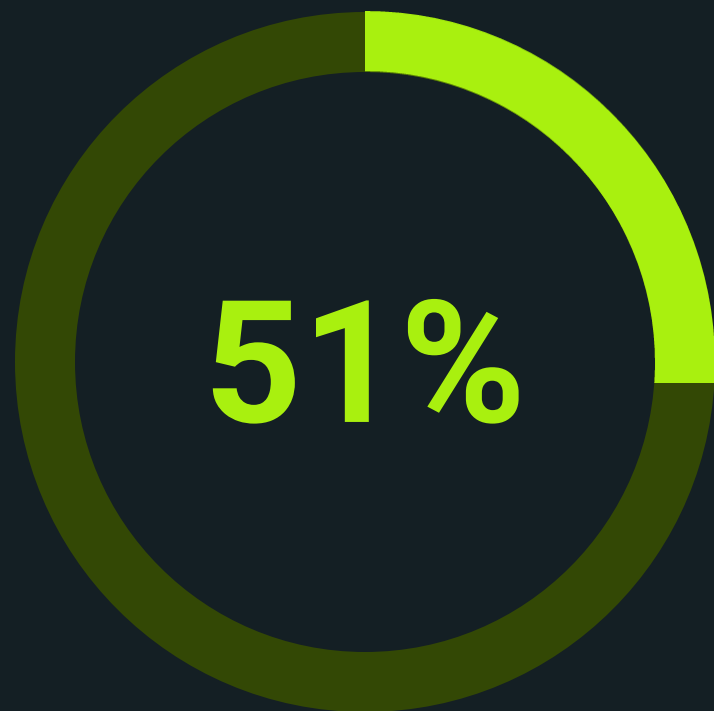
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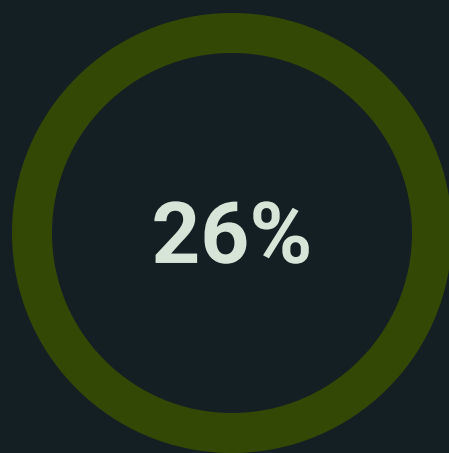
Asia Pacific Leads the World



Asia Pacific

Largest regional share of global vegetable seed market in 2025.

China and India are the key countries in the region that report high vegetable production and consumption.



Europe

Second largest regional share in 2025.

Source: [Fortune Business Insights](#)

Malaysia's Seed Import Crisis

> **90%**

Imported Seeds

Malaysia imports more than 90% of vegetable seeds for domestic use, totalling **1,108 thousand metric tons** in 2020.

Top Imported Varieties

Water Spinach: 648,075 thousand MT

Spinach: 226,616 thousand MT

Mustard: 49,711 thousand MT

Data reflects national import figures for the year 2020.

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Why Import Dependency Is a Risk

20+ Years of Neglect

High dependence on imported seeds for over two decades has left the local vegetable seed industry underdeveloped compared to the paddy sector.

Rising Input Costs

If imported seed prices increase, national food production is directly threatened, raising production costs and ultimately consumer prices.

Government Action

The government is now seriously addressing high dependence on imported agricultural inputs as a national food security priority.

RECALCITRANT SEEDS

What Are Recalcitrant Seeds?

The Definition

The term *recalcitrant seeds* was introduced by E. H. Roberts in the early 1970s. Literally meaning "stubborn" or "resistant," these seeds are **highly sensitive to drying**.

Critical Thresholds

Viability is lost when moisture content is reduced even slightly. Scientifically, they die if:

- Dried to a moisture content of **12–31%**
- Exposed to temperatures **near freezing** (Roberts, 1973)

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A Century of Seed Science

1**1908**

A. J. Ewart classified seeds into microbotic, mesobiotic, and macrobotic categories in *Proceedings of the Royal Society, Victoria*.

2**Early 1970s**

E. H. Roberts introduced the term *recalcitrant seeds*, revolutionizing seed biology terminology.

3**Early 1980s**

Scientists began formally discussing and characterizing the properties of recalcitrant seeds in depth.

Recalcitrant vs. Orthodox Seeds

Resistance to drying exists along a continuum — from **highly recalcitrant** (very sensitive) to **orthodox** (fully tolerant).

Recalcitrant

12–31% Moisture Limit

Extremely sensitive to drying; losing moisture results in rapid loss of viability.

- Cannot be stored long-term
- Lose viability quickly
- Common in tropical plants

Orthodox

Tolerant to Drying

Can be dried to low moisture levels (often < 5%) without damage.

- Can be stored dry
- Long shelf life
- Easier for gene bank storage

Most tropical plants produce recalcitrant seeds, creating unique challenges for agriculture and forestry.

Pioneering Research in Malaysia

1

Prof. H. F. Chin

Universiti Putra Malaysia – first researcher to study recalcitrant seeds in Malaysia in **1975**.

2

Landmark Book

In **1980**, Chin and Roberts co-published *Recalcitrant Crop Seeds*, a foundational reference in the field.

3

Species Studied

Cocoa (1984), rubber (1987), and jackfruit (1989) were among the first recalcitrant seeds researched.

GLOBAL COLLABORATION

International Research Institutions

1**UPM & UKM**

Universiti Putra Malaysia and Universiti Kebangsaan Malaysia continue leading local recalcitrant seed research.

2**FRIM**

Forest Research Institute Malaysia contributes significantly to tropical seed biology studies.

3**Global Partners**

University of KwaZulu-Natal, National Seed Storage Lab (USA), IRD (France), and Royal Botanic Gardens, Kew (UK).

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CONCLUSION

Seeds Shape Our Future

From global markets to Malaysia's food security, and from century-old science to cutting-edge research — seeds are at the heart of agriculture.

Understanding and protecting them is essential for a sustainable food future.

Sources:**Kemandirian Industri Benih Sayuran Negara**

by Nurul Huda Sulaiman & Nik Rahimah Nik Omar (Socio-Economic Research Center, MARDI Serdang)

Rahsia & Misteri: Biji Benih Tropika Spesis Rekalsitran

by Normah Mohd Noor