

Sarawak Gold (SG1) Pineapple: Characteristics, Cultivation and Future Prospects of an Emerging Malaysian Premium Pineapple

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ABSTRACT

The Sarawak Gold (SG1) pineapple, a premium tropical fruit, has emerged as a symbol of Sarawak's agricultural excellence and Malaysia's diversification into high-value agricultural exports. Renowned for its vibrant golden hue, superior sweetness, and unique aroma, SG1 pineapple combines exceptional sensory qualities with a robust nutritional profile, positioning it as a premium agricultural commodity for international export. This article explores the historical background, unique agronomic features, and cultivation practices that have contributed to the development and success of SG1 pineapple. Emphasizing sustainable farming methods and the pivotal role of smallholder farmers, the article highlights how the SG1 pineapple industry fosters rural economic development and supports the livelihoods of local communities. The branding of SG1 as a premium product has elevated its market demand, enabling expansion into Asia-Pacific and European markets, and solidifying its status as a valuable export commodity for Malaysia. Through its contribution to export revenues, job creation, and rural prosperity, SG1 pineapple not only enhances Sarawak's economy but also reinforces Malaysia's position as a global leader in the production of high-quality tropical fruits. However, as SG1 pineapple is a relatively new cultivar, published scientific information remains limited; therefore, this review synthesizes currently available data and identifies key research gaps to guide future studies.

Keywords: SG1 pineapple, Sarawak gold pineapple, pineapple yield, bromelain, sustainable farming

INTRODUCTION

Pineapple farming has indeed played a significant role in Malaysia's agricultural landscape, with its roots tracing back to the colonial era. Initially cultivated for domestic consumption, the pineapple quickly transitioned into a key export crop, contributing substantially to the economic development of the country. Over the years, Malaysia has established itself as a leading producer of high-quality pineapples, with major plantations located in states such as Johor, Selangor, and Sarawak (1,2). In recent decades, Sarawak has gained recognition for its unique variety, the Sarawak Gold (SG1) pineapple. Through years of selective breeding and agricultural refinement, SG1 pineapple has emerged as a premium cultivar known for its exceptional sweetness, vibrant golden hue, and aromatic qualities. This evolution reflects a broader trend in Malaysian agriculture, emphasizing quality over quantity, which aligns with global preferences for specialty and high-value crops (3,4). The SG1 pineapple, officially registered as AC19, is valued for its superior sensory attributes as well as its advantageous agronomic characteristics which include a high Brix level that indicates sweetness, a tender yet firm texture, and a distinctive aroma that enhances its market appeal (1). The SG1 pineapple stands out among other varieties due to its unique sensory attributes. Its sweetness and appealing texture make it a favourite among consumers who prioritize natural flavours. The pineapple's golden hue is not only visually attractive but also serves as an indicator of its premium quality, further enhancing its desirability in both local and international markets (5). Beyond its physical attributes, the SG1

pineapple has become a symbol of Sarawak's agricultural excellence and identity. It represents the state's ability to produce world-class agricultural products while maintaining its cultural and environmental heritage. The cultivation of SG1 pineapple highlights Sarawak's commitment to sustainable agricultural practices, showcasing how traditional farming methods can coexist with modern agricultural techniques (6,7). Economically, the SG1 pineapple significantly contributes to the agricultural exports of Sarawak, supporting local communities and creating job opportunities along the supply chain. The pineapple industry not only provides livelihoods for farmers but also stimulates related sectors, such as processing and distribution (1,4). Culturally, the SG1 pineapple embodies the traditions and values of Sarawak, often featured in local festivals and events, symbolizing prosperity and hospitality (5). Ecologically, the cultivation of SG1 pineapple emphasizes sustainable farming practices that prioritize environmental stewardship. The focus on eco-friendly methods aligns with global trends towards sustainability in agriculture, ensuring that the production of SG1 pineapple does not compromise the health of the ecosystem (2,8). This review article also traces SG1's journey from its cultivation in Sarawak's fertile soils to its growing prominence in global markets. By examining the factors that have propelled SG1 pineapple to its current status, the challenges it faces, and its future opportunities, this piece aims to offer a comprehensive understanding of why the SG1 pineapple is truly the crown jewel of Malaysian agriculture.

METHODOLOGY

This study adopted a systematic review framework to ensure academic rigor and reproducibility. Literature was retrieved from Scopus, Web of Science, ScienceDirect, and Google Scholar databases using combinations of the keywords "Sarawak Gold pineapple", "SG1 pineapple", "pineapple Brix Malaysia", "pineapple yield per hectare", "pineapple export Malaysia", and "sustainable pineapple farming". The inclusion criteria comprised peer-reviewed journal articles, government and institutional reports such as those from LPNM and the Ministry of Agriculture and Food Security, English-language publications, and studies published between 2010 and 2025, with earlier foundational works included where relevant. Exclusion criteria included non-verified sources, duplicate publications, and studies lacking empirical relevance to SG1 or premium pineapple varieties. Data were synthesized under thematic domains covering agronomic traits, sensory properties, nutritional composition, cultivation practices, economic contribution, commercialization challenges, and future opportunities. Given that SG1 Pineapple is a recently introduced cultivar, the availability of peer-reviewed scientific literature remains comparatively limited. Consequently, this review integrates relevant publications and credible institutional reports, and interpretations are made within the context of currently available evidence.

Historical Background

Introduction of Pineapple Farming in Sarawak

Pineapple farming in Sarawak has a rich history that dates back to the early 20th century, when it was introduced during the colonial period as part of efforts to diversify the region's agricultural sector. The fertile soils and favourable tropical climate of Sarawak provided ideal conditions for pineapple cultivation, quickly establishing the crop as a staple for local consumption and a growing commodity for export. Initially, traditional varieties of pineapple were planted, often for subsistence farming and small-scale trade within the region (9). The introduction of pineapple farming was part of a broader agricultural strategy aimed at enhancing food security and generating income for local communities. As the demand for pineapples grew, particularly in international markets, Sarawak's farmers began to adopt more systematic cultivation practices, transitioning from subsistence farming to commercial production.

This shift not only contributed to the local economy but also positioned Sarawak as a significant player in the global pineapple market (10). Over the years, the cultivation of pineapples in Sarawak has evolved, with farmers increasingly focusing on improving the quality of their produce. The introduction of modern agricultural techniques and better management practices has led to enhanced yields and the development of premium pineapple varieties. This evolution reflects a growing recognition of the importance of quality in agricultural products, aligning with global trends that favour specialty crops (11).

In the early years, the cultivation of pineapple was largely centered around traditional varieties, which were well-suited for subsistence farming. These varieties were cultivated by smallholder farmers who relied on them for their livelihoods, engaging in local trade and consumption. The initial focus on traditional farming methods allowed for the establishment of a local market for pineapples, which gradually expanded as demand increased (12). As the pineapple industry developed, farmers began to adopt more systematic cultivation practices, transitioning from subsistence farming to commercial production.

This shift not only contributed to the local economy but also positioned Sarawak as a significant player in the global pineapple market. The introduction of modern agricultural techniques, such as improved irrigation and fertilization methods, allowed for higher yields and better quality fruit, further enhancing the competitiveness of Sarawak's pineapple industry (13).

The evolution of pineapple farming in Sarawak reflects the region's adaptability and resilience in the face of changing agricultural practices and market demands. Today, Sarawak is recognized not only for its pineapple production but also for its commitment to sustainable farming practices that prioritize environmental stewardship and community well-being (14). The ongoing focus on quality improvement and the development of premium pineapple varieties underscores the importance of this crop to Sarawak's agricultural identity and economic future.

Figure 1 illustrates the pineapple cultivation statistics for the Sarawak region in 2022, as reported by the Ministry of Agriculture and Food Security, Malaysia. It highlights Sarawak's ranking as the second-largest producer of pineapples in Malaysia. The data reveals a total planting area of 2,288.7 hectares, representing the land allocated for pineapple farming. Of this, 1,817.35 hectares are classified as the result area, meaning the actively cultivated and productive farmland. Sarawak's total pineapple production for the year is reported to be an impressive 34,173.3 metric tons.



Figure 1 Area and production of pineapple in the Sarawak region in 2022 (Ministry of Agriculture and Food Security, Malaysia)

Development of SG1 as a unique cultivar through selective breeding

Recognizing the potential of pineapple as a high-value agricultural product, efforts were made to develop a superior cultivar tailored to Sarawak's unique environment and consumer preferences. Through years of selective breeding and agricultural experimentation, the SG1 pineapple emerged as a distinct variety.

Researchers and local farmers collaborated to refine its characteristics, prioritizing sweetness, aroma, and disease resistance while optimizing its ability to thrive in Sarawak's tropical conditions. The development of SG1 pineapple marked a significant milestone in Sarawak's agricultural history, positioning the state as a

key player in Malaysia’s pineapple industry. Today, SG1 pineapple represents not only a triumph of agricultural innovation but also a cornerstone of Sarawak’s economic and cultural identity.

It is a testament to the region’s commitment to harnessing its natural resources sustainably while meeting global demand for premium-quality produce.



Figure 2 Harvested pile of SG1 pineapples, highlighting the fruit’s distinctive appearance and export readiness. SG1 pineapple as a key player in Malaysia’s pineapple industry (15)

The TG Agro Fruit pineapple farm in Sungai Tukau, Sarawak, is leading the cultivation of the SG1 pineapple variety, which holds significant potential for boosting Malaysia’s pineapple production and exports(reference).

According to the Minister of Agriculture and Food Security, Malaysia is poised to expand its global pineapple exports to meet the growing international demand, currently estimated at 4,000 containers annually, far exceeding the country's capacity to supply just one-fifth of this demand. With the establishment of this farm, SG1 pineapple seeds can now be distributed across Sarawak and Malaysia.

The Malaysian Pineapple Industry Board (LPNM) aims to expand Sarawak’s pineapple cultivation area to 20,000 hectares by 2030, utilizing the state’s 59,000 hectares of idle land, potentially surpassing Johor as the country’s primary pineapple-producing region. Currently, Malaysia’s pineapple exports, primarily in juice form, are directed to markets such as Singapore, China, Europe, and Japan. Sarawak has approximately 700 pineapple farmers concentrated in Samarahan, Betong, Mukah, and Miri.

As of February 2024, SG1 cultivation covered 52.5 hectares, with an expected seed output of 11.9 million by 2026, as part of efforts to expand SG1 cultivation nationwide (16)(BERNAMA news, accessed on 10 October 2025). In addition to its operation in East Malaysia, Shein Home Development Sdn Bhd is also actively cultivating SG1 pineapple in Peninsular Malaysia, particularly in Negeri Sembilan, with a plantation area exceeding 100 acres.

Unique Characteristics of Sarawak Gold Pineapple (SG1)

Agronomic Features

The SG1 pineapple thrives in the unique soil and climatic conditions of Sarawak, which are instrumental in shaping its exceptional quality. The region's tropical climate, characterized by consistent rainfall, high humidity, and warm temperatures, provides an ideal environment for pineapple cultivation (17,18). This climatic stability is crucial for the growth of the SG1 pineapple cultivar, as it allows for optimal photosynthesis and nutrient uptake, leading to enhanced fruit quality and yield. Research indicates that pineapple cultivation benefits significantly from such climatic conditions, as they contribute to optimal growth and fruit quality (3,19,20). Additionally, the fertile, well-drained soils of Sarawak, rich in organic matter, support the robust growth of the SG1 pineapple cultivar, enhancing its yield and overall quality. These soil conditions facilitate optimal nutrient availability, which is essential for healthy plant development and contributes to the overall quality of the fruit (21,22). Studies have shown that soil composition and fertility play critical roles in fruit development, influencing factors such as size, sweetness, and nutritional content (23). The organic-rich soils not only provide essential nutrients but also improve soil structure, facilitating better water retention and drainage, which are vital for pineapple cultivation (22)

SG1 pineapple is celebrated for its natural disease resistance, a crucial trait that minimizes the need for excessive chemical inputs and promotes sustainable farming practices. It demonstrates resilience against common pineapple pests and diseases, reducing losses for farmers and ensuring consistent production. The ability to cultivate SG1 pineapple with fewer chemical interventions aligns with modern agricultural practices that emphasize sustainability and environmental stewardship.

Furthermore, the optimized growth cycle of SG1 pineapple enables efficient cultivation, allowing farmers to predict harvest times accurately and maintain a steady supply to meet market demand. The SG1 pineapple variety is ready to harvest in about nine months (24). This is much faster than other pineapple varieties, which can take more than a year to mature. This short-term in harvest is essential for both local consumption and export, reinforcing the economic viability of SG1 pineapple cultivation in the region.

Sensory Attributes

The SG1 pineapple is renowned for its unparalleled sensory qualities that set it apart from other pineapple varieties. Its superior sweetness is scientifically measured using Brix levels, with SG1 pineapple consistently achieving high scores that reflect its natural sugar content. This sweetness is perfectly complemented by a mild, balanced acidity, making it a favourite among consumers who seek a harmonious flavour profile (25). The aroma of the SG1 pineapple is another defining feature that sets it apart. Studies have identified a variety of volatile compounds that contribute to the distinctive tropical scent of pineapples, with esters being the most significant contributors to the aroma profile (26,27).

Specifically, compounds such as ethyl hexanoate and methyl hexanoate have been noted for their strong association with the characteristic pineapple aroma (27,28). The fragrant aroma of SG1 pineapple not only enhances its appeal when consumed fresh but also makes it a desirable ingredient in various culinary dishes and beverages.

The pineapple's texture is tender yet firm, ensuring a satisfying bite without being fibrous. This desirable texture is a result of the fruit's ripening process and its inherent physiological characteristics, which are influenced by factors such as soil quality and cultivation practices (29).

Visually, the vibrant golden hue of SG1's flesh (Figure 3) is a hallmark of its premium quality, symbolizing freshness and richness that resonates with both local and international markets. Table 1 summarizes the comparative positioning of SG1 relative to MD2 and Golden Sweet varieties. SG1's shorter production cycle and premium sweetness profile present strategic advantages over comparable varieties, although expanded empirical validation is required to substantiate its superiority under diverse agronomic conditions.



Figure 3 Full and cross-section view of SG1 pineapple

Table 1 Comparative characteristics of premium pineapple varieties

Parameter	SG1	MD2	Golden Sweet
Average Brix (°Bx)	~15–18*	14–17	13–15
Maturity period	~9 months	12–14 months	~12 months
Flesh color	Deep golden	Yellow	Yellow
Market position	Emerging premium niche	Established global premium	Regional premium
Branding maturity	Developing	Highly established	Moderate

*Values may vary depending on soil and agronomic management.

Nutritional Profile

The SG1 pineapple is increasingly recognized as a nutrient-dense fruit, appealing to health-conscious consumers and specialty markets. Its high vitamin C content is particularly noteworthy, as this vitamin is essential for immune health and acts as a potent antioxidant, helping to neutralize free radicals in the body (30). The presence of dietary fiber in SG1 pineapple further enhances its health benefits by promoting digestive health and aiding in weight management (31). Research has shown that dietary fiber can improve bowel regularity and contribute to overall gut health (32), making SG1 pineapple a valuable addition to a balanced diet. Moreover, SG1 pineapple is rich in natural phenolic compounds, which are known for their antioxidant properties. These compounds not only enhance the health benefits of the pineapple but also contribute to its shelf life, making it a preferred choice for export markets. The antioxidant activity in SG1 pineapple is attributed to various bioactive compounds, including catechins and flavonoids, which have been linked to a reduced risk of chronic diseases such as diabetes and cardiovascular conditions (33). This aligns

with current consumer trends that favor foods offering both health benefits and exceptional taste, reinforcing SG1 pineapple's status as a premium agricultural product (30).

In addition to its nutritional composition, SG1 pineapple exhibits outstanding agronomic features and sensory attributes. The unique flavor profile of SG1 pineapple, characterized by its balance of sweetness and acidity, enhances its appeal in culinary applications (34). The fruit's juiciness and vibrant tropical flavor make it a popular choice for various food products, including juices, smoothies, and desserts (35). Furthermore, ongoing research into the functional properties of pineapple, including its potential as a source of probiotics and other health-promoting compounds, underscores the fruit's versatility and value in modern diets (36). Table 2 represents a comparison of essential nutrients in 100s of general pineapples and approximately in SG1 pineapples, with their health benefits. The ongoing research and development in this area further highlight the potential of SG1 pineapple as a functional food, catering to the evolving preferences of consumers seeking health benefits in their dietary choices.

Table 2 Essential nutrients in 100g of general pineapple and approximately in SG1 pineapple, with their health benefits

Nutrients	General pineapple	SG1 pineapple	Potential Health benefits
	Amount		
Calories (kcal)	52	50	Provides a quick source of energy with low-calorie content, making it ideal for weight management.
Dietary Fiber (g)	1.4	1.4	Supports digestive health and promotes a feeling of fullness, aiding in weight control.
Carbohydrates (g)	13.7	13.1	Supplies energy through natural sugars, aiding in maintaining energy levels throughout the day.
Protein (g)	0.54	0.50	Contributes to tissue repair and overall body function, albeit in small amounts.
Potassium (mg)	150	109	Supports heart health by regulating blood pressure and balancing electrolytes.
Magnesium (mg)	12	12	Plays a role in muscle function, nerve transmission, and bone health.
Calcium (mg)	16	13	Helps in maintaining strong bones and teeth.
Vitamin A (IU)	130	58	Supports eye health and contributes to maintaining healthy skin.
Vitamin C (mg)	24	47.8	Boosts the immune system, acts as an antioxidant, and enhances skin health.

Cultivation Practices of SG1 Pineapple

Cultivating SG1 pineapple reflects a blend of traditional farming wisdom and modern agricultural advancements, ensuring both sustainability and efficiency in production. Figure 4 (A) depicts the SG1 pineapple plantation in Miri, Sarawak, while Figure 4 (B) displays the SG1 pineapple plantation in Mantin, Negeri Sembilan. In Sarawak, Red-Yellow Podzolic (RYP) soil and Alluvial soil, categorized under the mineral soil series, are identified as optimal for pineapple cultivation (37). The cultivation of the SG1 pineapple begins with meticulous land preparation, which is critical for ensuring optimal growth conditions. This process includes clearing the land, levelling, and creating raised beds to facilitate proper drainage, which is an essential factor for pineapple cultivation. Poor drainage can lead to root rot and other diseases, which can severely impact plant health and yield. Incorporating organic compost and natural fertilizers into the soil enhances fertility and supports healthy plant growth. Organic fertilization not only increases carbon and nitrogen content but also improves soil structure, which is vital for nutrient absorption (38). Nitrogen (N) is a key nutrient in plant growth, playing a crucial role in the formation of chlorophyll (Chl), amino acids, proteins, and protoplasm. Chlorophyll is essential for photosynthesis, the process through which plants convert sunlight, water, and carbon dioxide into glucose, which is vital for their growth (39). The availability of nitrogen directly influences the growth rate and overall health of the pineapple plants, making it a critical component of soil fertility management (40).

In addition to nitrogen, phosphorus (P) and potassium (K) are two other significant nutrients that contribute to plant health. Phosphorus is vital for energy transfer and storage within the plant, while potassium helps maintain osmotic balance, phloem transport, and photosynthesis (41). The proper balance of these nutrients is essential for maximizing growth and yield. Research indicates that the nutrient requirements of pineapple plants can vary at different growth stages, making it important to monitor and adjust fertilization practices accordingly (42). Soil testing is a crucial practice for determining the nutrient status of the soil, particularly nitrogen levels, which can serve as an indicator of the plant's growth potential. Farmers often face challenges in managing soil fertility due to a lack of knowledge about proper fertilization techniques and soil testing facilities (39). Therefore, integrating organic and chemical fertilizers can be a promising strategy to meet the nutrient demands of pineapple crops while promoting sustainable agricultural practices (38). The successful cultivation of the Sarawak Gold Pineapple relies on meticulous land preparation, the incorporation of organic matter, and careful management of essential nutrients such as nitrogen, phosphorus, and potassium. These practices not only enhance soil fertility but also support the robust growth and high yield of the SG1 cultivar, ensuring its quality and market viability.

Farmers cultivating the SG1 Pineapple employ a combination of traditional practices and modern innovations to optimize production. One of the key aspects of this cultivation strategy is the careful planning of planting density. By optimizing space utilization, farmers ensure that each plant receives adequate sunlight exposure, which is essential for photosynthesis and overall plant health. Research indicates that the arrangement of plants can significantly influence their growth and fruit quality, with proper spacing allowing for better air circulation and light penetration. The use of high-quality suckers and slips, derived from healthy mother plants, is another critical practice that contributes to the robustness of the SG1 cultivar. High-quality planting materials are known to enhance the vigor and disease resistance of the crops, leading to improved yields. Studies have shown that the size and type of planting material directly correlate with fruit size and quality, emphasizing the importance of selecting the best planting materials for successful crop production (39). For instance, using suckers that are well-developed and disease-free can lead to stronger plants that are more resilient to environmental stresses and pests (43). Farmers also recognize the significance of environmental factors in pineapple cultivation. The choice of planting material, along with the management of soil fertility and planting density, can significantly influence the overall success of the crop. For instance, the use of organic compost and natural fertilizers can enhance soil fertility and promote healthy plant growth, while also reducing the reliance on chemical inputs. This approach aligns with sustainable agricultural practices that aim to minimize environmental impact while maximizing productivity.

Harvesting the SG1 pineapple requires precision and care to preserve the fruit's quality. Farmers traditionally rely on visual cues, such as the vibrant golden colour of the fruit and its aromatic scent, to determine ripeness.

The development of aromatic compounds during the ripening process is crucial, as these compounds contribute to the fruit's sensory attributes, including its sweet and fruity aroma, which is characterized by esters such as ethyl hexanoate and ethyl butanoate (25).

The visual indicators of ripeness, combined with the aromatic profile, guide farmers in selecting the optimal time for harvesting, ensuring that the fruit achieves its maximum flavour potential. Modern harvesting practices have evolved to enhance the efficiency of operations while minimizing damage to the fruit. The use of specialized tools and transportation equipment designed to reduce bruising is essential in this process. Bruising can significantly affect the quality and marketability of pineapples, leading to increased post-harvest losses (44). Therefore, employing techniques that minimize physical impact during harvesting and handling is critical for maintaining fruit integrity.

In addition to visual and olfactory cues, the timing of harvest is influenced by the physiological changes that occur in the fruit as it matures. As maturity increases, the sugar and acid compositions in the pineapple change, which not only affects flavor but also the overall quality of the fruit (25). This understanding of the biochemical processes involved in ripening allows farmers to make informed decisions regarding the timing of harvest, further enhancing the quality of the SG1 pineapple.

Increasingly, SG1 pineapple farmers are adopting sustainable practices to meet global demands for environmentally responsible agriculture. Techniques such as crop rotation, integrated pest management (IPM), and the use of organic mulches reduce environmental impact and maintain soil health. Additionally, water conservation strategies, including drip irrigation and rainwater harvesting, are employed to minimize resource wastage while supporting consistent crop growth.

The adoption of sustainable practices among SG1 pineapple farmers is crucial for meeting the growing global demand for environmentally responsible agriculture. By integrating crop rotation, IPM, organic mulches, and water conservation strategies, farmers can enhance productivity while minimizing their environmental impact. These practices not only support the health of the soil and ecosystem but also contribute to the long-term viability of pineapple farming, especially in Sarawak.

Crop rotation is a sustainable practice that involves alternating the types of crops grown in a particular area over time. This technique helps to break pest and disease cycles, improve soil fertility, and reduce the need for chemical fertilizers and pesticides (45). By rotating crops, farmers can enhance biodiversity, which is crucial for maintaining healthy ecosystems and resilient agricultural systems. Meanwhile, IPM is another critical component of sustainable agriculture that SG1 pineapple farmers are increasingly implementing. IPM combines biological, cultural, physical, and chemical tools to manage pests in an environmentally and economically sustainable manner (46). This approach minimizes the reliance on chemical pesticides, thereby reducing the potential for chemical runoff into local waterways and promoting a healthier ecosystem (47). By using natural predators, crop rotation, and resistant plant varieties, farmers can effectively manage pest populations while minimizing environmental harm.

The use of organic mulches is also gaining traction among SG1 farmers. Organic mulches, such as straw or compost, help improve soil structure, retain moisture, and suppress weeds (48). They contribute to soil health by enhancing microbial activity and increasing organic matter content, which is essential for nutrient cycling (49). Additionally, organic mulches can help reduce the carbon footprint of farming operations by sequestering carbon in the soil and reducing greenhouse gas emissions associated with synthetic fertilizers. Additionally, water conservation strategies are equally important in sustainable pineapple farming. Techniques such as drip irrigation and rainwater harvesting are being employed to minimize resource wastage while supporting consistent crop growth (50).

Drip irrigation delivers water directly to the plant roots, reducing evaporation and runoff, which is particularly beneficial in regions experiencing water scarcity. Rainwater harvesting systems can capture and store rainwater for irrigation, further enhancing water use efficiency and reducing dependence on groundwater resources.



Figure 4 SG1 Pineapple plantation in (A) Miri, Sarawak (B) and in Mantin, Negeri Sembilan

Economic Impact

National Economic Impact

The cultivation and commercialization of the SG1 pineapple have emerged as measurable contributors to Sarawak’s agricultural GDP, export earnings, and rural employment generation. Malaysia’s pineapple exports reached approximately RM1.4 billion in 2025, with shipments of around 76,000 tonnes to destinations including China, the Middle East, and Europe, reflecting the sector’s rising global market presence. The industry has been targeted to grow further to RM2 billion by 2027 through strategic expansion and processing investments (51).

At the farm level, SG1 and other premium varieties such as MD2 command higher prices than standard local cultivars. Market analyses show export-grade MD2 has a farm-gate range of RM2.00–RM5.50 per kg, with SG1 estimated to achieve a 20–35 % price premium due to superior sensory quality and export desirability (e.g., sweeter fruit, uniform size, longer shelf life). Retail pricing abroad for premium tropical fruits also tends to exceed local farm prices, indicating elevated value capture along the value chain (52). In 2024, Malaysia’s total pineapple exports were valued at approximately RM1.1 billion, with Sarawak contributing 8–10% of premium fresh fruit exports. Preliminary commercialization of SG1 indicates potential annual export earnings of RM40–60 million from 8,000–10,000 tonnes of SG1 exports at premium market prices (Table 3). Retail value in international markets may reach RM8–12 per kg, compared to RM6–8 per kg for standard varieties.

Table 3 SG1 Pineapple Export Revenue Projections (52)

Parameter	Value	Notes
Export volume (Year 1)	8,000 - 10,000 tonnes	Initial market entry (China, Sing
Farm-gate price	RM4.0 - 5.5/kg	20–35% premium over MD2

Export value (Year 1)	RM40 - 60 million	Assumes full compliance with international standards
Retail export price	RM8–12/kg	Upscale supermarket and premium channels

From an income perspective, smallholder farmers cultivating high-yielding pineapple varieties can achieve substantially higher returns than traditional staple crops. In 2024, national reports highlighted that pineapple growers could earn up to RM9,000 per hectare per month through modern farm management and market engagement, supporting household incomes and rural livelihoods. This underscores the potential for increased net income when adopting high-value cultivars, like SG1, which offer premium quality and higher market prices (51).

Employment generation is another tangible impact of pineapple sector growth. Malaysia’s pineapple value chain engages over 8,000 growers and more than 300 companies, thereby supporting farm labour, logistics, processing, and export coordination activity across rural and peri-urban communities. Quality certification, mechanization, and enhanced supply chains further magnify employment multipliers across supporting service sectors (52).

The growth trajectory of SG1 aligns with Malaysia’s agricultural diversification agenda under national agro-food strategies that seek to shift focus from traditional commodities toward high-value horticultural exports. Enhanced grading systems, certification programmes (e.g., MyGAP, GLOBALG.A.P., HACCP), and quality traceability support export market compatibility and broader diversification of agricultural exports (53).

Furthermore, agritourism linked to pineapple farms has begun generating supplementary economic activity. Farm-based experiences such as plantation tours, fruit-tasting events, and branded merchandise sales can contribute additional revenue, estimated in similar agri-tourism models to range from hundreds of thousands to over a million ringgit annually per established cluster, stimulating rural economies and diversifying income streams. SG1 pineapple demonstrates quantifiable economic impact through enhanced export revenue potential, higher smallholder incomes, rural employment expansion, and broader value chain stimulation, reinforcing its role as a strategic high-value crop within Malaysia’s agricultural economy.

Global Market Demand and Recognition

The SG1 pineapple has been successfully branded as a premium tropical fruit, synonymous with quality and luxury. Its distinctive sweetness, aroma, and golden hue position it as a standout product in both domestic and international markets. Marketing efforts have emphasized its exclusivity, driving demand among consumers. (54). The branding strategy for SG1 pineapple has effectively highlighted its unique characteristics, which not only appeal to consumers looking for premium quality but also align with current trends favouring exotic and healthy food options (55). The increasing popularity of tropical fruits in regions such as the Asia-Pacific, Europe, and the Middle East has opened doors for SG1 pineapple to penetrate new markets. Export initiatives have focused on meeting international standards for quality, safety, and sustainability, ensuring that SG1 pineapple aligns with the expectations of global consumers (56).

The emphasis on sustainability is particularly relevant as consumers in these regions increasingly prioritize environmentally friendly products. This trend is supported by research indicating that sustainable practices in agriculture can enhance marketability and consumer trust (57). Trade fairs, promotional campaigns, and strategic partnerships with distributors and retailers worldwide have supported SG1 pineapple's entry into competitive markets. In the Asia-Pacific region, countries like China and Japan have emerged as key importers, valuing the fruit’s premium status and health benefits (58). In Europe, where consumers prioritize

sustainable and exotic produce, SG1 has gained traction as a high-value addition to the tropical fruit segment (59).

The success of SG1 pineapple in these markets illustrates the effectiveness of targeted marketing strategies that resonate with consumer preferences for quality and sustainability. The growing recognition of SG1 pineapple as a symbol of Sarawak’s agricultural excellence has had ripple effects on related industries. Agritourism centred around pineapple farms has flourished, attracting visitors eager to learn about SG1 pineapple cultivation and taste the fruit at its source (54). This not only promotes local tourism but also enhances the overall economic impact of SG1 pineapple cultivation. Furthermore, the strong export performance and expanding international market penetration of SG1 pineapple have stimulated advancements in packaging and branding strategies, thereby enhancing Malaysia’s international reputation as a producer of high-quality agricultural products (55). The focus on innovative packaging solutions has been shown to improve product appeal and shelf life, which is crucial for maintaining quality during transportation (60).

By contributing significantly to Sarawak’s regional economy, diversifying Malaysia’s agricultural export portfolio, and gaining increasing international recognition, the SG1 pineapple exemplifies how a single high-value agricultural commodity can generate transformative economic impacts. Strategic branding and targeted marketing initiatives have strengthened SG1’s premium positioning, while simultaneously supporting broader national objectives such as rural income enhancement, value chain upgrading, and sustainable agricultural development (57,59). These efforts are occurring within a favorable global market context. As illustrated in Figure 5, the global pineapple market is projected to experience steady growth between 2025 and 2030, with total market value expected to reach approximately USD 41.87 billion by 2030, with a CAGR of 7.5%, driven by rising consumer demand for fresh and processed tropical fruit products. Against this backdrop of expanding international demand, Malaysia is poised to initiate the export of its proprietary SG1 pineapple cultivar in the coming year, with China and Singapore identified as the initial destination markets, thereby positioning SG1 to capitalize on emerging global opportunities (61).

Pineapples Market Report 2026

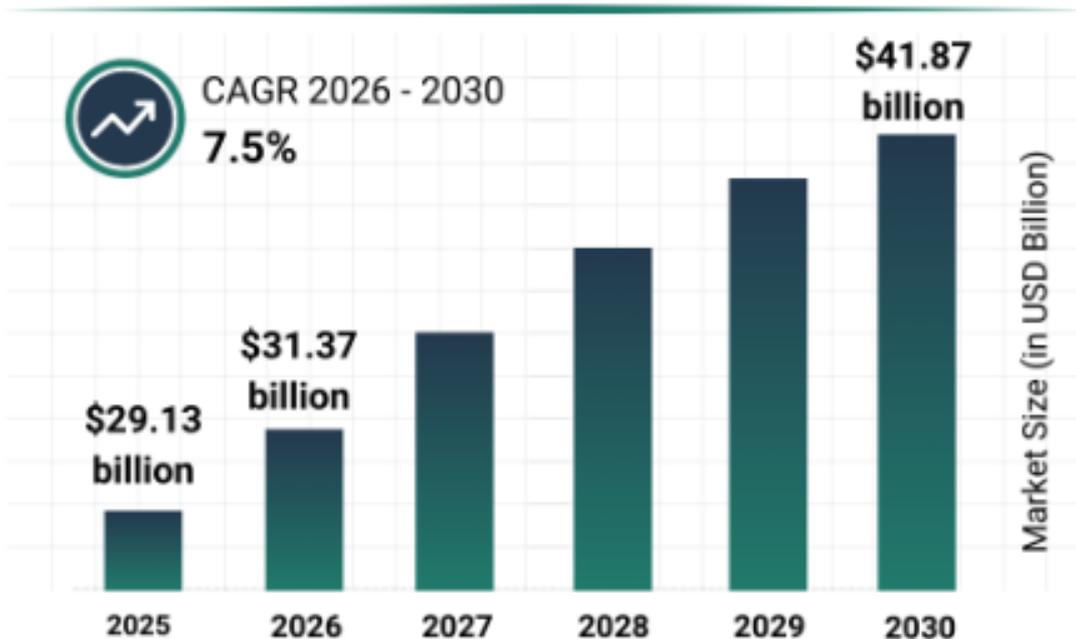


Figure 5 Pineapple market growth trend chart indicating projected market expansion on global demand growth (62)

Challenges and Future Opportunities

SG1 pineapple variety holds immense promise in the global market due to its superior quality and unique characteristics. However, to fully realize its potential, there are several challenges in cultivation, commercialization, and market expansion that must be addressed.

At the same time, future opportunities in research, innovation, and global trade can propel the SG1 pineapple into becoming a major player in the international pineapple market.

Challenges in Cultivation and Commercialization

As the SG1 pineapple industry expands, pest and disease management become a growing challenge. Pineapples are susceptible to various pests and diseases, such as the pineapple mealybug, root rot, and fungal infections, which can reduce yield and quality.

Managing these issues requires constant vigilance, as well as the use of integrated pest management (IPM) techniques that balance chemical and non-chemical methods. This is particularly important as farmers transition to more eco-friendly practices, which limit the use of harmful pesticides.

Developing and implementing effective pest and disease control strategies is essential for maintaining the productivity and sustainability of SG1 pineapple plantations.

Another challenge for SG1 producers, particularly smallholders, is the integration of modern agricultural technologies. Traditional irrigation and fertilization approach often result in inconsistent fruit size and quality, which is problematic for meeting strict export-grade specifications.

Pilot projects in Southeast Asia have demonstrated that precision irrigation combined with soil moisture monitoring can improve water efficiency and yield uniformity, and fertigation systems in Thailand have improved nutrient delivery and average fruit weight when compared to conventional fertilization practices.

These examples illustrate how adopting precision agriculture can enhance productivity while maintaining environmental sustainability and lowering input costs (63).

Commercialization is also constrained by postharvest losses and inconsistent grading standards, which can undermine export reliability. In many developing tropical fruit supply chains, postharvest losses due to inadequate cooling, lack of pre-cooling infrastructure, and extended transport durations can exceed 20% of total production.

Investment in centralized pre-cooling facilities, cold-chain optimization, and standardized sorting and packaging, as seen in several export-oriented fruit industries, has been effective at reducing spoilage and ensuring international phytosanitary compliance.

These coordinated approaches, alongside cooperative aggregation models that improve smallholder bargaining power and compliance with export standards, provide a template that SG1 producers could adapt to strengthen market readiness.

Research and Innovation

Research into breeding disease-resistant and higher-yielding SG1 pineapple varieties is crucial for enhancing the resilience of pineapple cultivation.

By developing varieties that are less susceptible to common diseases and pests, farmers can reduce the need for chemical treatments, lower production costs, and increase overall yields.

Additionally, breeding for traits such as drought resistance and improved nutrient uptake can help SG1 pineapple varieties thrive in varied climates and under changing environmental conditions.

This research can also focus on improving fruit quality, ensuring consistency in sweetness, size, and appearance, while enhancing shelf life for longer marketability.

Innovation in post-harvest technology plays a pivotal role in improving the commercial viability of SG1 pineapples.

Advances in techniques such as controlled atmosphere storage, modified atmosphere packaging, and refrigeration can extend the shelf life of fresh pineapples, reducing spoilage and waste.

Additionally, exploring value-added products such as pineapple juice, dried pineapple, pineapple-based jams, and other processed goods can open new revenue streams for farmers and producers.

By investing in research for efficient preservation and processing methods, the SG1 pineapple industry can tap into the growing demand for convenience foods and specialty products in both domestic and international markets.

Value-added processing presents another avenue for industry diversification. Case examples from the Philippines highlight how pineapple processing into juice, dried products, and by-products like fiber can generate additional revenue streams and reduce waste.

Investment in dehydration and functional food research, such as optimizing drying processes to preserve antioxidants and flavor compounds, could position SG1 products in high-value convenience and specialty food markets.

Market Expansion Opportunities

Global demand for premium tropical fruits continues to grow, particularly in regions with expanding middle-class consumption and heightened interest in health-oriented foods. Leveraging existing and emerging free trade agreements can create preferential access for SG1 pineapples, reduce tariff barriers, and enhance competitiveness in major markets.

The expansion of Southeast Asian fruit exports under regional trade frameworks demonstrates the potential of policy-aligned export strategies to accelerate international market penetration and strengthen brand recognition.

The Middle East and North America are emerging markets that hold significant potential for the SG1 pineapple industry. These regions have seen increasing demand for fresh and processed tropical fruits, driven by a growing middle class, urbanization, and greater health consciousness among consumers.

The sweet and distinctive flavour of SG1 pineapples could make them a highly sought-after product in these regions. Additionally, the halal certification of SG1 pineapples and pineapple-based products could help open doors in Muslim-majority countries in the Middle East, creating new export opportunities.

Expanding into these untapped markets will require strategic marketing, efficient distribution networks, and partnerships with international distributors and retailers.

While the SG1 pineapple industry faces significant challenges in pest and disease management, technological adoption, postharvest logistics, and global market competition, case studies from established pineapple systems worldwide demonstrate that these issues can be effectively mitigated through evidence-based strategies.

By integrating sustainable pest management approaches, adopting advanced cultivation and postharvest technologies, diversifying product applications, and pursuing strategic export initiatives, SG1 pineapples can realize their potential as a globally competitive premium fruit.

CONCLUSION

SG1 pineapple stands as a testament to Malaysia's agricultural innovation and rich biodiversity, reflecting the nation's capacity to translate natural resources into high-value economic assets. Distinguished by its superior sweetness, vibrant golden hue, and extended shelf life, SG1 has earned recognition as the "Crown Jewel" of Malaysian agriculture. These premium sensory and post-harvest qualities position it competitively in both domestic and international markets, where demand for high-quality tropical fruits continues to grow. Beyond its commercial appeal, the SG1 pineapple symbolizes Malaysia's broader commitment to sustainable agricultural transformation. Its cultivation presents an opportunity to integrate eco-friendly farming practices, circular economy approaches, and the fusion of traditional agronomic knowledge with modern technologies.

By optimizing resource efficiency, minimizing waste, and adopting climate-smart practices, the SG1 industry can redefine pineapple production as a sustainable model. Such an approach not only reduces environmental impact but also enhances resilience against climate change and resource constraints, ensuring long-term industry viability. This sustainability-driven framework directly reinforces SG1's economic significance. As a high-value crop, its cultivation and commercialization can stimulate rural development by generating employment, strengthening smallholder participation, and contributing to national GDP growth. Increased productivity and quality consistency enhance export readiness, enabling Malaysia to diversify its agricultural export portfolio. With rising global demand for exotic and premium fruits, SG1 holds strong potential to expand Malaysia's presence in international markets through strategic branding, market penetration into untapped regions, and the development of value-added products. Culturally, the SG1 pineapple embodies the agricultural heritage and identity of Sarawak, showcasing regional ingenuity and biodiversity.

As an ambassador of Malaysian produce, it reinforces the country's reputation for excellence in tropical fruit production and strengthens connections with global consumers who value authenticity, quality, and sustainability. Thus, SG1 is not merely an agricultural commodity; it represents a convergence of innovation, sustainability, economic opportunity, and cultural pride. To fully realize this potential, coordinated and strategic actions are essential. Policymakers should enhance research and development funding to support varietal improvement, post-harvest technology, and climate-resilient cultivation practices.

Strengthening export facilitation mechanisms and modernization programs for smallholders will improve efficiency, inclusivity, and competitiveness across the supply chain. At the farm level, the adoption of precision agriculture techniques, cooperative marketing systems, and standardized grading protocols can ensure supply consistency and strengthen bargaining power. Meanwhile, exporters must invest in premium branding, sustainability certification, and advanced cold-chain logistics to safeguard quality during international distribution. Through integrated policy support, technological advancement, and market-oriented strategies, SG1 pineapple can serve as a cornerstone of Malaysia's agricultural future, driving export diversification, empowering rural communities, and positioning the nation as a global leader in premium and sustainable tropical fruit production.

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