Where are all the quandongs?

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Abstract
Quandong (*Santalum acuminatum* [R.Br.] A.DC.) has a deep-rooted presence in Australia's ecological and cultural history. The Indigenous Peoples of Australia, one of the world's oldest living continuous cultures, have utilised quandong for over 50,000 years. The historical significance of quandong is further highlighted by the discovery of its fossilized remains in Southern Victoria, dating back 40 million years, indicating its long-standing presence in the region. Research on quandong has a long and varied history, being one of the first bushfoods in Australia to undergo scientific scrutiny. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) has played a pivotal role in this regard since 1973, focusing on developing commercially viable quandong cultivars. The fruits of this research have led to the creation of varieties like 'Powell's No. 1' and 'Frahn's Paringa Gem'. Despite these developments and the continued interest in the quandong industry, there are significant impediments to its growth. These include environmental challenges, pests and diseases and a lack of advanced eco-physiological and agronomic understanding, all of which are essential for establishing a sustainable and profitable quandong production industry. This paper discusses the agronomic challenges in developing quandongs as an emerging industry.

Keywords
***Santalum acuminatum*, native foods, market analysis**

Introduction

The Australian native food industry, characterized by its diversity and encompassing several thousand edible species, has been the focus of developmental efforts over the years. Among these, the macadamia nut stands out as a notable success, despite its primary development occurring outside Australia. As of now, Australian native species lack representation in the top 150 global crop plants. However, the value of Australian native food production has seen a remarkable increase, from $18 million to $25 million between 2013 and 2018, soaring to $80 million in 2022, with expectations to double by 2025.

Within this burgeoning industry, quandong (*S. acuminatum*) is recognised as a priority fruit by the Australian Native Foods and Botanicals (ANFAB). This bushfood, native to southern Australia, has emerged as a significant species, not just for its cultural value but also for its potential in commercial production. Despite the challenges it faces, such as environmental adversities, pests, and lack of an industry body since the dissolution of the Australian Quandong Industry Association, the quandong industry's economic potential continues to be promising yet largely untapped.

Market analysis

In the current market, quandong, is retailed in several processed forms, notably as frozen halves, dried halves and dried powder. The pricing strategy for these products varies significantly, based on the form and processing method.

Nine online retail sources that sell quandong products were investigated by the authors (Kaiyu Superfoods, Nuts About Life Australia, Indigiearth, Taste Australia Bush Food Shop, Aussie Bush Foods, Oz Tukka Australia, Gather Foods, Bent Shed Produce, & Natif Foods). The market analysis for dried quandong products, encompassing both dried halves and dried powder, reveals a broad pricing spectrum. Prices for these dried forms range from $300 to $899 per kilogram. Based on data collected from nine retail sources, the average price for dried Quandong products is calculated to be $564 per kilogram. This average serves as a benchmark for potential buyers and sellers in the industry, indicating a high value placed on dried quandong products due to their shelf stability and concentrated flavour.

In contrast, the wholesale price for frozen quandong halves is notably lower, set at $30 per kilogram (R. Tavian pers. comm 2024.; Laurie 2020). This price point underscores the affordability of quandong in their frozen form at the wholesale level. The significant price disparity between the wholesale frozen product and

retail dried products underscores the value added through processing and the market's segmentation based on product form and intended use. Farm gate prices range from $30.00/kg to $50.00kg fresh weight (R. Tavian pers. comm 2024; D. Chapman pers. comm 2024; M Coop pers. comm 2024).

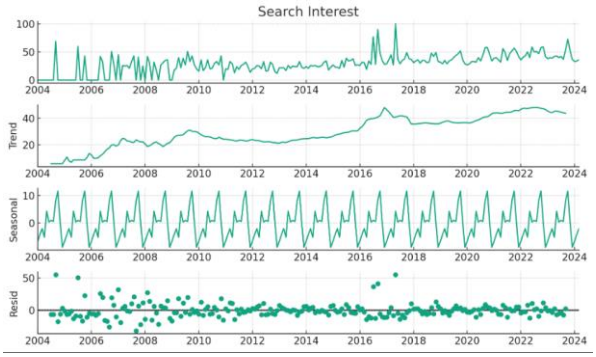

Figure 1. Search interest in 'quandong' showing an upward trend between 2004 and 2024. The analysis of Google Trends data for 'quandong' search interest in Australia was performed using Python with the Pandas library for data manipulation and Matplotlib for visualisation. Time series decomposition was conducted to assess trends, seasonality, and residuals, employing the Statsmodels library's seasonal decompose function. This approach allowed for the examination of underlying patterns in search interest over the period from January 2004 to March 2024.

Figure 1 provides a comprehensive analysis of the public interest in 'quandong' as reflected in online search patterns within Australia from 2004 to early 2024. The uppermost graph captures the raw search interest, showing significant spikes and variations over time. The 'Trend' line in the second graph smooths out these fluctuations to illustrate a clearer, upward trajectory in interest towards quandong, suggesting a growing awareness or popularity of this native fruit. Seasonality is explored in the third graph, where predictable, cyclic patterns are evident, possibly reflecting seasonal awareness of quandong fruiting times or periods of increased culinary activity such as festivals or seasonal markets. The 'Resid' graph at the bottom indicates the residuals, the component of the data that remains after the trend and seasonality have been accounted for, offering insights into irregular occurrences or anomalies in search behaviour that might correlate with specific events or media coverage.

Indigenous opportunities and IP

Incorporating Indigenous traditional knowledge into quandong production presents an opportunity for creating culturally sensitive and Indigenous-led business and supply chain models, as highlighted by Jarvis et al. (2022). This body of traditional knowledge, deeply rooted in Indigenous cultural and intellectual property (ICIP), has been nurtured and handed down through generations, forming a cornerstone of substantial Indigenous heritage. The integration of this knowledge into the sector is crucial for its growth; however, it necessitates a careful balance between the commercial utilisation of ICIP and the protection, accessibility, and benefits for Indigenous communities. Addressing the challenges surrounding ICIP may involve leveraging current intellectual property laws, while also considering the unique, location-specific aspects of ICIP, as discussed by Jarvis et al. (2022).

IP Australia, an entity of the Australian Government, has committed to safeguarding the Indigenous Knowledge of Aboriginal and Torres Strait Islander peoples (Janke & Sentina, 2018). To this end, it proposes four pivotal actions: the creation of an Indigenous Advisory Panel to offer a structured Indigenous perspective to IP Australia; refining the trademarks and designs frameworks to prevent the granting of rights over Indigenous Knowledge in manners deemed inappropriate, unfair, or offensive by Aboriginal or Torres Strait Islander peoples or communities; implementing new protocols for declaring the origins of Indigenous Knowledge in innovations; and establishing labelling schemes to identify genuine Aboriginal or Torres Strait Islander products (Janke & Sentina, 2018).

Furthermore, it is imperative for researchers to engage with Indigenous communities in a manner that transcends mere knowledge extraction. Maclean et al. (2021) advocate for a collaborative approach, urging that partnerships with Indigenous communities involve joint design, execution, governance, and authorship of research projects. This ensures that such collaborations are equitable and contribute positively to the involvement of both the academic and Indigenous communities.

Current and future production

Quandong thrives in the arid and semi-arid regions of Western Australia, South Australia, Queensland, New South Wales, Victoria, and the Northern Territory (Loveys & Tyerman, 2002. Commercial cultivation faced a decline in the early 2000s due to inadequate understanding of the plant's semi-parasitic nature and its sensitive root system (Ehleringer et al., 1985). However, with recent advancements in cultivation knowledge and growing interest from prominent chefs, production has been on a slow upward trend (Loveys & Tyerman, 2002)

These plants, requiring four years to bear fruit, produce berries that are harvested manually, halved to remove the seed, and then either frozen or dried for distribution. The industry primarily caters to wholesalers who then supply to niche markets, including specialty restaurants and retail outlets. Between 2011 and 2019-2020, production doubled from six to approximately 12.1 tonnes, with the farm gate price averaging $30/kg. Notably, the industry is small, with about 25 growers, most managing under 500 trees (M Coop pers. comm 2024).

Geographic suitability for quandong cultivation

Figure 2 presents the predicted geographic suitability for the cultivation of the quandong, based on the research conducted by Canning (2022). The blue areas denote regions considered environmentally suitable for quandong growth, indicating adequate conditions for the plant's semi-parasitic nature and its specific ecological requirements. These suitable regions correlate strongly with soil types and biogeographical zoning that support quandong's unique root system and host species availability. Conversely, the red areas represent regions deemed unsuitable for quandong cultivation due to environmental factors that do not align with the plant's needs, such as soil composition or climate conditions.

This suitability mapping is a critical tool for current and prospective quandong growers, providing a visual guide to optimise cultivation strategies and potentially expand production. The delineation by soil order mapping and the Interim Biogeographic Regionalisation for Australia (IBRA) further refines the understanding of quandong's habitat preferences, essential for successful cultivation and long-term sustainability of the industry (McKenzie et al., 2012; IBRA, 2020). The data underscore the importance of location-specific agronomy and the need for targeted research and development to overcome cultivation challenges in the less suitable red zones.

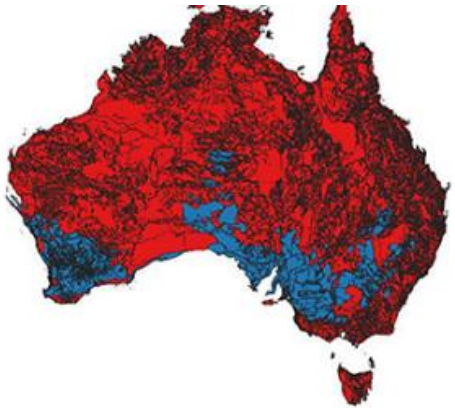

Figure 2. Predicted geographic suitability of the quandong (*Santalum acuminatum*) (reproduced from Canning, 2022). Blue indicates the suitable environmental range, while red indicates the unsuitable range, with locations delineated by soil order mapping and IBRA mapping (McKenzie et al., 2012; IBRA, 2020).

Conclusion

The quandong industry presents a significant opportunity within the Australian native foods market, which is currently experiencing considerable growth. Despite historical and current challenges, the industry has shown resilience and potential, with the value of production steadily increasing and interest from both domestic and international markets on the rise. Key to future success will be addressing the various challenges that have historically impeded industry growth, such as irregular supply, propagation difficulties, pest management and the development of robust supply chains. Strategic investment in research, especially in areas such as cultivation best practices, pest control, and effective use of host species, will be essential. Furthermore, the industry can benefit from the rich cultural heritage and traditional knowledge of Indigenous communities, which can inform sustainable and culturally sensitive cultivation practices. By facilitating knowledge sharing and supporting collaboration across the sector, there is potential to improve productivity, profitability, and the overall sustainability of the quandong industry. Moving forward, it is crucial for stakeholders to work together, integrating traditional knowledge with modern agricultural practices, to ensure the quandong's place not only in the Australian market but also on the global stage. The steps taken today to consolidate supply chains, improve cultivation techniques, and respect and incorporate Indigenous knowledge will lay the foundation for a robust and vibrant quandong industry well into the future.

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