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Passion Fruit Farming and Value Chain in Zimbabwe: Current Insights and Future Prospects

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Abstract: Passion fruit (*Passiflora edulis*), commonly known as granadilla in Southern Africa, is emerging as a high-value horticultural crop in Zimbabwe with nutritional, industrial, and economic potential. Globally, it is prized for its flavor, health benefits, and diverse applications across food, beverage, cosmetic, and pharmaceutical industries. While neighboring countries such as Kenya, Uganda, and South Africa are established suppliers, Zimbabwe's industry remains underdeveloped, constrained by climatic challenges, limited infrastructure, and weak certification systems. This review synthesizes current insights into passion fruit farming and the value chain in Zimbabwe, examining production practices, farmer participation, and industrial applications. It highlights agronomic requirements, common challenges such as cultivar decline, pests, and postharvest losses, and explores opportunities in food processing, cosmetics, and export markets. The analysis identifies critical gaps in smallholder productivity, value addition, and market competitiveness. Future prospects lie in genomics-assisted breeding, climate-smart irrigation, integrated pest management, and investment in cold chain logistics and certification. By integrating scientific innovation with sustainable farming and market-driven value chains, passion fruit can evolve into both a nutritional commodity and an economic driver, contributing to rural livelihoods, industrial diversification, and foreign currency earnings in Zimbabwe.

Keywords: Agro-processing, Passion fruit, Value chain, Farming, Future prospects

INTRODUCTION

Passion fruit (*P. edulis*), commonly known as granadilla in Southern Africa, is a tropical and subtropical crop of increasing importance across the farming sector. Globally, passion fruit is valued for its distinctive flavor, high nutritional content, and diverse applications across the food, beverage, pharmaceutical, and cosmetic sectors (Meletti & Bruckner, 2011). Its pulp is particularly rich in vitamins A and C, dietary fiber, and antioxidants, attributes that have contributed to its classification as a "superfood" and enhanced its appeal among health-conscious consumers (Ramaiya et al., 2019). Beyond fresh consumption, passion fruit is widely processed into juices, concentrates, jams, flavoring agents, and essential oils, creating strong demand in international markets.

The global passion fruit market has experienced steady growth, driven by rising consumer preference for natural and functional foods. Market projections indicate a compound annual growth rate of approximately 4–5% over the past decade, underscoring its expanding role in global horticulture (FAO, 2020). In Africa, countries such as Kenya, Uganda, and South Africa have established themselves as key suppliers to European and Middle Eastern markets (Nduwumuremyi et al., 2013). Zimbabwe, though relatively new to commercial passion fruit production, has begun to reposition the crop as a high-value

horticultural commodity. National initiatives such as the Horticulture Recovery and Growth Plan have emphasized passion fruit's potential to generate foreign currency earnings and improve rural livelihoods (Government of Zimbabwe, 2021).

Regionally, passion fruit cultivation offers significant socio-economic benefits. The crop is well-suited to Zimbabwe's agro-ecological zones, particularly in areas with moderate rainfall and fertile soils. Smallholder farmers, who dominate Zimbabwe's agricultural landscape, stand to benefit from relatively high yields of up to 50 tons per hectare under optimal management and favorable market prices (Mashingaidze, 2022). Moreover, passion fruit's adaptability to intercropping systems and its potential for value addition through processing make it a strategic option for agricultural diversification and rural industrialization.

Despite these opportunities, the current state of passion fruit farming and its integration into Zimbabwe's value chain remains poorly documented. While global literature extensively documents passion fruit's nutritional and industrial applications, limited research has focused on Zimbabwe's production practices, farmer participation, industrial processing capacity, and export competitiveness. This review therefore sought to fill this gap by providing a comprehensive synthesis of available insights and highlighting future prospects. Specifically, the objectives were to:

1. assess the current state of passion fruit production in Zimbabwe, including farming practices, yield levels, and farmer participation;
2. analyze the industrial applications of passion fruit in food processing, beverage manufacturing, and cosmetic industries in Zimbabwe.
3. examine Zimbabwe's export potential and competitiveness in international markets, while identifying key challenges;
4. highlight future prospects and strategies for sustainable passion fruit growth in Zimbabwe.

By addressing these dimensions, the review positioned passion fruit as both a nutritional commodity and an economic driver for Zimbabwe's horticultural sector.

CURRENT STATE OF PASSION FRUIT PRODUCTION IN ZIMBABWE

Passion fruit (*P. edulis*) is a high-value tropical crop with growing demand in Zimbabwe's fresh fruit and juice markets. Assessing its current state requires examining its value chain as shown in figure 1.

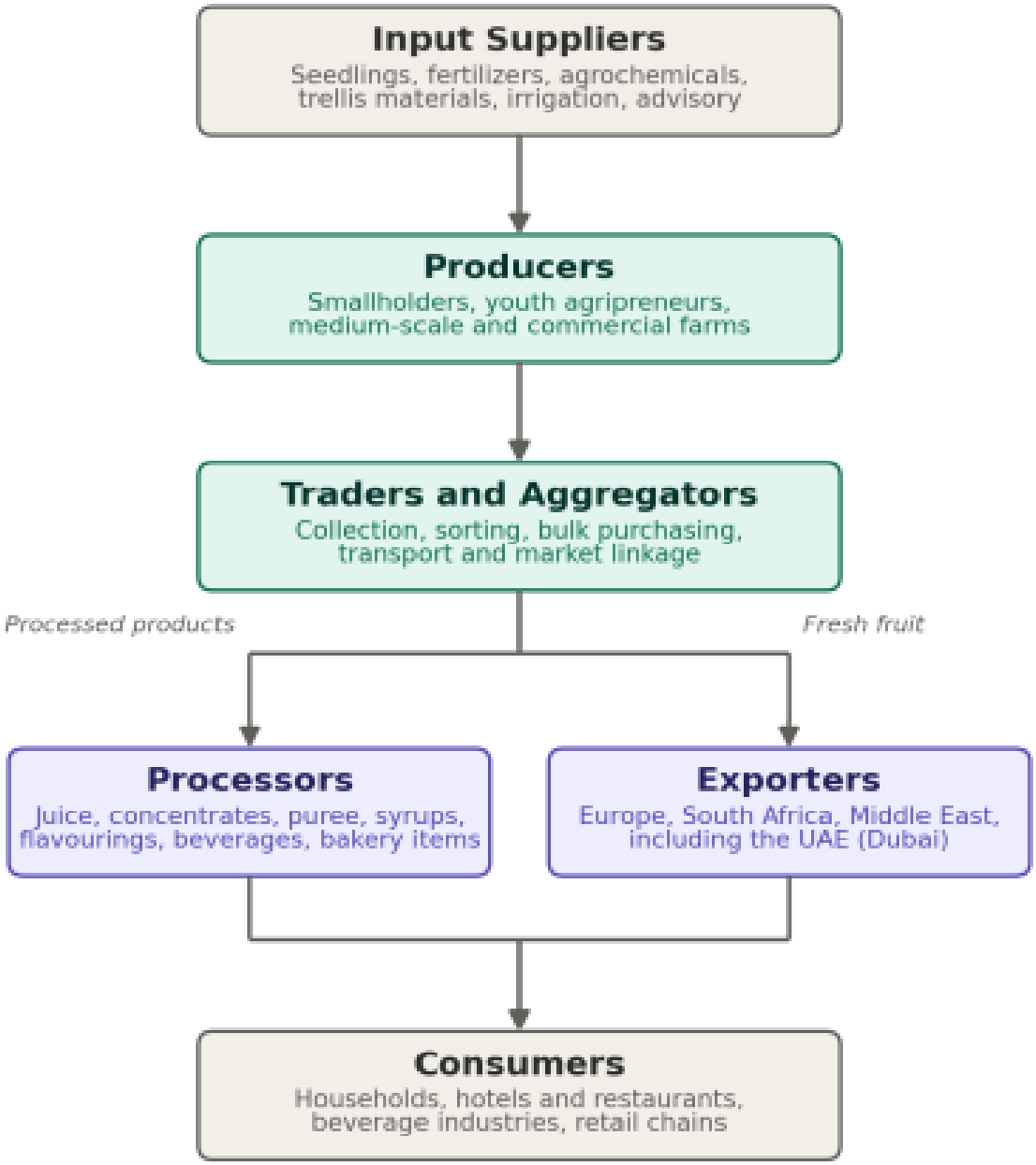


Figure 1: Passion fruit value chain in Zimbabwe

Farming Practices

Passion fruit farming in Zimbabwe is gradually evolving from small-scale subsistence production into a more structured horticultural activity. Farmers across different regions cultivate two main varieties: the purple passion fruit *(P. edulis f. edulis*) as shown in figure 2, which thrives in the cooler highland areas of Nyanga and Mutare and the yellow passion fruit (*P. edulis f. flavicarpa*) as shown in figure 3 which is better suited to the warmer lowland climates of the country. This agrees with authors such as Rodriguez *et al* 2019 who reported that temperature, solar radiations, humidity and water dynamics are the primary factors affecting the adaptation and yield of passion fruit varieties. Therefore, the geographical distribution of passion fruit varieties in Zimbabwe reflects the crop's sensitivity to climate and soil conditions, shaping the farming practices adopted by growers.



Figure 2: Purple Passion fruit



Figure 3: Yellow passion fruit

One of the most notable practices is the use of trellis systems. Commercial farmers often employ T-trellis or vertical curtain structures to support the vines as shown in figure 4. These systems not only maximize fruit exposure to sunlight but also improve air circulation, reducing the risk of fungal infections (Cleves 2021). Trellising has become a hallmark of modern passion fruit farming in Zimbabwe, though its adoption among smallholders remains limited due to the high cost of materials and construction. Most smallholder farmers in Zimbabwe cultivate only a few passion fruit vines at the backyards of their homesteads, where the plants often climb onto existing trees such as mangoes as shown in figure 5, rather than being trained on trellis lines.



Figure 4: Passion fruit T-shaped Trellis



Figure 5: A passion fruit vine on a tree

Another important technique is grafting. Farmers commonly graft purple varieties onto yellow rootstocks to enhance resistance against soil-borne diseases such as Fusarium wilt and nematodes. This practice extends the productive lifespan of vines and ensures more consistent yields. While grafting requires technical skill and access to quality seedlings, it has proven to be a valuable innovation for commercial farms aiming to meet export standards. This agrees with Dos Santos *et al* 2014 who concluded that grafting purple and

yellow passion fruits is a successful and feasible technique cementing its relevance in passion fruit farming. On the other hand, smallholder passion fruit growers do not graft their plants and often grow them from seed without grafting. This has increased disease outbreak especially in the purple varieties that are less resistant to fusarium wilt. (Gardner 1989)

Agronomical practices that enhance proper Passion fruit growing such as: Proper land preparation, weeding, mulching, Irrigation, pruning, pest and disease control are greatly prioritized by commercial passion fruit growers in Zimbabwe. Small scale growers however, tend not to pay a lot of attention to practices such as pest and disease control due to limited funds hence low output. Passion fruit farming practices in Zimbabwe therefore, reflect a blend of traditional knowledge and modern innovations. While commercial farmers have embraced modern agronomical practices such as trellising, grafting, and integrated pest management among others, smallholders remain constrained by financial and technical barriers. Addressing these challenges through training, affordable inputs, and infrastructure support could significantly enhance the productivity and sustainability of passion fruit farming in the country.

Yield Levels

Passion fruit farming in Zimbabwe has shown promising results in terms of yield, though outcomes vary depending on the variety cultivated and the management practices employed (Xinhang et al 2025, De Oliviera *et al* 2025)) Under favorable conditions, farmers can achieve yields ranging between 8-15 tons per hectare making the crop a potentially lucrative horticultural enterprise. The purple passion fruit *(Passiflora edulis f. edulis*) is commonly grown in the cooler highland regions such as Nyanga and Mutare produces smaller fruits with a sweeter flavor, which are highly preferred in fresh fruit markets. However, its yields are generally lower, averaging between 8-10 tons per hectare. Despite the reduced output compared to other varieties, the purple passion fruit remains popular due to its taste and suitability for fresh consumption. (Thokchom and Mandai 2020)

In contrast, the yellow passion fruit *(Passiflora edulis f. flavicarpa*) thrives in warmer lowland areas. It produces larger fruits with a more acidic flavor, making it ideal for juice processing and industrial applications. Yields for this variety can reach up to 15 tons per hectare under good management, positioning it as the more productive option for farmers targeting commercial and export markets (Thokchom and Mandai 2020)

Table 1: Zimbabwe Passion Fruit Exports & Imports (2018-2024)

Year	Export Volume (kg)	Export Value (USD)	Import Volume (kg)	Import Value (USD)
2018	210,000	185,000	12,000	14,500
2019	250,000	220,000	15,500	18,000
2020	280,000	250,000	16,200	19,000
2021	310,000	290,000	17,000	20,500
2022	350,000	330,000	18,500	22,000
2023	392,399	400,632	19,800	24,000
2024	465,081	410,988	20,891	25,592

Source: International Trade Centre. (2025)

Although, passion fruit yields in Zimbabwe demonstrate strong potential, the sustainability of production depends on addressing biological and infrastructural constraints. With improved disease management, better post-harvest handling, and investment in farmer training, Zimbabwean growers could consistently achieve higher yields and strengthen the country's competitiveness in both local and international markets.

Farmer Participation

Passion fruit farming in Zimbabwe is still at an emerging stage with participation gradually increasing as awareness of its economic potential among farmers. The crop is cultivated both by smallholder farmers and larger commercial ventures, though the scale and objectives of production differ significantly between the two groups.

Among smallholder farmers, passion fruit is typically grown on plots ranging from one to two hectares. These farmers often target local markets, selling fresh fruit directly to consumers or small traders. Their participation is motivated by the relatively high market value of passion fruit compared to other traditional fruits. However, smallholders face challenges in adopting modern farming practices due to limited financial resources and technical knowledge. As a result, yields and quality are often inconsistent, which restricts their ability to access larger processing companies or export markets. (Karani-Gichimu *et al* 2015 and Jokotola *et al* 2025). On the other hand, commercial ventures have invested more heavily in passion fruit production. These farms typically operate on larger tracts of land and employ advanced techniques such as trellising, grafting, and drip irrigation. Their focus is not only on supplying fresh fruit but also on producing high-value products such as juice concentrates and seed oil for cosmetic industries. According to Netherlands Enterprise agency (2020) commercial farmers are better positioned to meet export standards and to integrate into regional and international value chains, making them key drivers of Zimbabwe's competitiveness in passion fruit markets compared to smallholder farmers.

Passion fruit production in Zimbabwe therefore, shows great promise but remains under developed among smallholder farmers. Expanding farmer participation through improved farming practices, better disease management, and stronger market access will be critical for scaling production. If these constraints are addressed, passion fruit could become a cornerstone of Zimbabwe's horticultural diversification strategy, benefiting both smallholder farmers and commercial enterprises.

INDUSTRIAL APPLICATION OF PASSION FRUITS IN ZIMBABWE

Passion fruit has significant industrial applications in Zimbabwe and globally, particularly in beverage manufacturing, Food processing and cosmetics. Its pulp, seeds, and peel are utilized for juices, concentrates, oils, and bioactive compounds, making it a versatile crop with economic potential. (Fernandez 2026, Silva & Costa 2025 and Rodriguez 2024)

Beverage Manufacturing

The beverage industry in Zimbabwe represents the largest consumer of passion fruit, with the crop integrated into a wide range of products that cater for domestic markets. Its strong

aroma, tangy flavor, and nutritional properties make it a versatile ingredient across juices, carbonated drinks, alcoholic beverages, and functional health drinks, thereby positioning it as a cornerstone of the country's agro-processing sector.

One of the most prominent applications is in juice making where passion fruit pulp is solely packed or combined with other fruits such as mango, orange, or pineapple to produce tropical flavors that resonate strongly with Zimbabwean consumers. Brands such as Revive as shown in figure 6 are popularly consumed by many locals across the country. These brands diversify product offerings and enhance the competitiveness of Zimbabwe's fruit juice industry, reflecting the crop's growing role in value addition. This agrees with Betancur-Ancona *et al* 2025 who reported that passion fruit flavored beverages have a high commercial potential



Figure 6: Packaged Passion fruit juice brand in Zimbabwe

Beyond juices, passion fruit is increasingly incorporated into carbonated and sparkling beverages. Its distinctive taste provides a refreshing alternative to conventional soda flavors for example small beverage firms in major cities across Zimbabwe have begun experimenting with passion fruit sodas to capture niche urban markets. This innovation highlights the adaptability of passion fruit to evolving consumer preferences, particularly among younger demographics seeking novel tropical flavors. (Betancur-Ancona *et al* 2025)

In the alcoholic beverage sector, passion fruit has found a place in wines, liqueurs, and craft beers. Some local wineries incorporate passion fruit into tropical wines and liqueurs marketed as premium products, targeting both domestic consumers and tourists seeking authentic Zimbabwean flavors. Similarly, craft breweries have begun experimenting with passion fruit infusions, producing beers with a fruity profile that appeal to younger, experimental drinkers. These developments illustrate how passion fruit contributes to product differentiation and premiumization within Zimbabwe's alcoholic beverage industry.

Equally important is the crop's role in functional and nutraceutical drinks. Passion fruit contains bioactive compounds such as polyphenols and carotenoids, which are associated with health benefits including improved immunity and digestion. Zimbabwean entrepreneurs are increasingly exploring this niche, developing nutraceutical beverages that position passion fruit as a "superfood" ingredient. This aligns with global trends toward healthier, functional beverages and offers opportunities for Zimbabwe to tap into emerging wellness markets. (Betancur *et al* 2025)

Hence passion fruit plays a central role in Zimbabwe's beverage manufacturing industry. From tropical juice blends and sodas to wines, liqueurs, and functional health drinks, the crop's versatility has created opportunities for innovation, diversification, and market expansion. While challenges such as limited processing infrastructure and post-harvest losses remain, the growing demand for tropical flavors and health-oriented products positions passion fruit as a key driver of Zimbabwe's beverage sector growth and competitiveness in regional and international markets.

Food Processing

Passion fruit has become an increasingly important fruit in Zimbabwe's food processing sector, owing to its distinctive aroma, flavor, and nutritional qualities. Beyond its role in beverages, the pulp, peel, and seeds are incorporated into a wide range of food products, reflecting both traditional consumption patterns and modern industrial innovations.

One of the most notable applications is in bakery and confectionery industries where passion fruit is used to enhance the sensory appeal of cakes, yogurts, ice creams, and candies. Its sweet yet tangy tropical profile provides a distinctive flavor that resonates with urban consumers seeking variety and novelty. As Fernandez (2026) observes, the incorporation of passion fruit into bakery and dairy products has diversified confectionery sector, aligning with the growing demand for exotic flavors in local markets. This is also being done in Zimbabwe

Equally significant is the crop's role as a functional food ingredient. Passion fruit is rich in vitamin C, dietary fiber, and antioxidants, attributes that make it attractive to health-conscious consumers. These nutritional qualities provide food processors with opportunities to position passion fruit-based products as functional foods, tapping into global trends toward healthier diets. In Zimbabwe, this has created potential for niche innovations such as fortified snacks, wellness bars, and dietary supplements. Silva and Costa (2025) emphasize that the bioactive compounds in passion fruit pulp and peel can be harnessed to develop wellness-oriented products, thereby expanding its relevance beyond traditional consumption.

In addition, passion fruit generates industrial by-products that are increasingly repurposed in food processing. The peel and seeds, which would otherwise be discarded, are processed into flour and dietary fiber additives that can be incorporated into baked goods and health foods. Importantly, passion fruit processing also generates valuable bye products. The peel and seeds, which would otherwise be discarded, are repurposed into flour and animal feed (Carlosama et al 2026). This not only reduces waste but also contributes to sustainability in the agro-processing sector. Some small enterprises have begun experimenting with seed oil extraction, which has applications in both food and cosmetic industries.

Rodriguez (2024) highlights the potential of passion fruit peel extracts not only in cosmetics but also in functional food ingredients, underscoring the crop's versatility and contribution to sustainability. By transforming waste into value-added products, Zimbabwean processors can reduce post-harvest losses while diversifying their product portfolios.

Taken together, these applications demonstrate that passion fruit's role in Zimbabwe's food sector extends well beyond beverages. Its integration into bakery, confectionery, functional foods, and industrial by-products illustrates both its nutritional value and its adaptability to evolving consumer preferences. This positions passion fruit as a strategic crop for value addition, health promotion, and industrial innovation within Zimbabwe's agro-processing landscape.

Cosmetic Industry

Passion fruit is steadily gaining importance in Zimbabwe's cosmetic industry, where its by-products are being harnessed for skincare, haircare, and sustainable production. This diversification highlights the crop's versatility beyond food and beverage applications, offering valuable raw materials for natural and eco-friendly cosmetic formulations.

One of the most notable applications is the extraction of seed oil which is rich in linoleic acid and antioxidants. These compounds make passion fruit seed oil highly effective in moisturizers and anti-aging creams, supporting hydration and skin barrier repair. According to Reis *et al* 2023 and Fratianni *et al* 2026, passion fruit seed oil has a fatty acid profile rich in linoleic acid and contains antioxidant compounds suitable for cosmetic applications. Similarly, Passion fruit also plays a role in haircare formulations. Oils and extracts are incorporated into shampoos and conditioners to improve hydration and scalp health, with Rodriguez (2024) noting their effectiveness in enhancing hair vitality. These products are particularly appealing in Zimbabwe's urban markets, where consumers increasingly seek natural solutions for hair maintenance and styling.

This has enabled local organic skincare brands in across major cities in Zimbabwe to begin incorporating this oil into their product lines, marketing it as a natural solution for skin health. Its antioxidant properties also provide protection against environmental stressors, positioning it as a premium ingredient in Zimbabwe's emerging natural cosmetics sector.

Equally promising is the use of peel extracts which contain bioactive molecules such as flavonoids and pectin. These compounds possess anti-inflammatory and skin-repair properties, making them suitable for incorporation into soaps and lotions. Zimbabwean cosmetic producers are experimenting with peel-based formulations that offer consumers affordable, plant-based alternatives to synthetic products. This innovation not only adds value to agricultural waste but also aligns with global trends toward sustainable and eco-friendly cosmetics.

Hence passion fruit's role in Zimbabwe's cosmetic industry underscores its potential as a multi-purpose crop. From seed oil in moisturizers to peel extracts in soaps and haircare products, passion fruit offers diverse applications that support both consumer health and environmental sustainability.

With continued investment in processing technologies and market development, Zimbabwe could establish itself as a regional hub for natural, passion fruit-based cosmetic products, thereby expanding the crop's economic significance beyond traditional agriculture.

PASSION FRUIT EXPORT POTENTIAL AND COMPETITIVENESS IN ZIMBABWE

Zimbabwe has strong export potential for passion fruit (granadilla), with growing demand in South Africa, Europe, and the UK. However, competitiveness is constrained by pests, diseases, climate requirements, and infrastructural gaps such as irrigation and cold-chain logistics.

Export Potential

Passion fruit has emerged as one of Zimbabwe's promising horticultural crops, with growing potential in international markets. The global demand for tropical "superfoods" has positioned passion fruit as a high-value export commodity, particularly among health-conscious consumers in Europe and Asia. Its rich nutritional profile, characterized by high vitamin C, antioxidants, and dietary fiber, makes it attractive for fresh consumption as well as for processing into juices, concentrates, and nutraceutical products.

Zimbabwe has already made strides in exporting passion fruit. In 2024 the country exported approximately 465,081 kilograms of fresh passion fruit valued at USD 410.988 with major destinations to South Africa, Portugal, the United Kingdom and France.

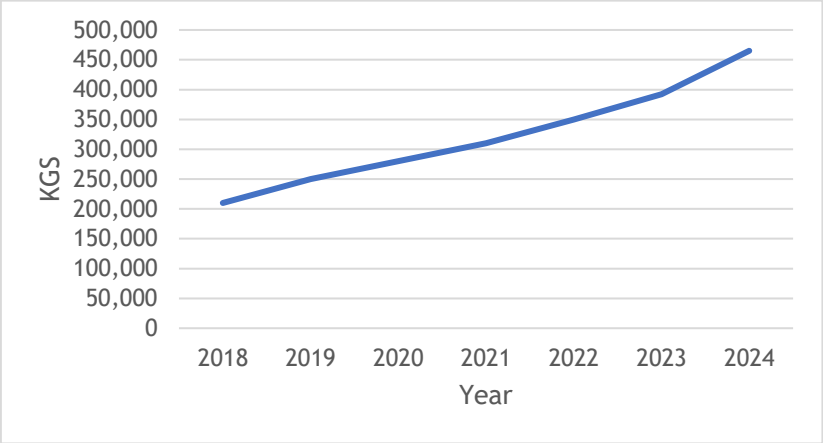


Figure 7: A line graph showing Zimbabwe passion fruit Exports from 2018-2024

The increasing trend in exports as shown in figure 7 highlight Zimbabwe's ability to penetrate competitive international markets, albeit on a relatively small scale. The flavor and quality of Zimbabwean passion fruit have been recognized, giving the country a niche advantage in premium markets.

Government support has been instrumental in positioning passion fruit as a priority crop. For example, The Horticulture Recovery and Growth Plan 2021 identified passion fruit as "low-hanging fruits" for export diversification. (Government of Zimbabwe 2021) This policy framework emphasizes integrating smallholder farmers into value chains, providing them with training, improved planting material, and market linkages. Such initiatives are designed to boost production volumes and ensure compliance with international phytosanitary standards.

Despite these opportunities, Zimbabwe faces significant challenges in scaling its passion fruit exports. Pests and diseases such as fruit flies, thrips, Fusarium wilt and

woodiness virus reduce yields and compromise fruit quality. Climate requirements also limit production zones, as passion fruit thrives best under moderate temperatures, high humidity, and rainfall above 1,200 mm per year. Infrastructural constraints further hinder competitiveness: irrigation systems are underdeveloped, cold-chain logistics remain inadequate, and processing facilities are limited. These factors contribute to post-harvest losses and restrict Zimbabwe's ability to consistently supply export markets.

In conclusion, Zimbabwe's passion fruit industry demonstrates strong export potential, supported by favorable agro-ecological conditions and rising global demand. However, competitiveness in international markets depends on addressing biological and infrastructural constraints. Strengthening farmer participation, investing in irrigation and cold-chain systems, and enhancing phytosanitary compliance will be critical steps toward positioning passion fruit as a sustainable export crop. With these improvements, Zimbabwe could establish itself as a regional leader in passion fruit production and trade.

Competitiveness Factors

The competitiveness of Zimbabwe's passion fruit industry in international markets is shaped by several key factors that enhance its appeal and marketability. These include its nutritional profile, diverse industrial applications, and the growing participation of smallholder farmers in structured value chains.

One of the strongest competitiveness factors is the fruit's nutritional appeal. Passion fruit is rich in antioxidants and vitamin C, aligning with global consumer demand for natural, immune-boosting foods. This nutritional advantage positions Zimbabwean passion fruit as a premium product in health-conscious markets across Europe and Asia. The emphasis on wellness and functional foods worldwide provides Zimbabwe with an opportunity to market passion fruit not only as a tropical delicacy but also as a superfood ingredient.

Another factor is the fruit's diverse applications across industries. Passion fruit is widely used in juices, smoothies, wines, and cosmetics, which enhances its marketability. Zimbabwean processors and exporters can tap into multiple value chains, ranging from food and beverage manufacturing to natural skincare products. This versatility reduces reliance on a single market segment and strengthens the crop's resilience against price fluctuations in global trade.

Finally, smallholder participation is increasingly being encouraged through farmer clusters and the adoption of good agricultural practices. By organizing farmers into cooperatives and providing training in disease management, trellising, and irrigation, Zimbabwe can improve production volumes and quality standards. This collective approach also facilitates compliance with international export requirements, such as phytosanitary regulations, thereby enhancing competitiveness in demanding markets like the European Union.

Hence, Zimbabwe's passion fruit industry benefits from strong nutritional appeal, diverse industrial applications, and growing smallholder participation. These factors provide a foundation for competitiveness in international markets. However, to fully capitalize on these advantages, Zimbabwe must continue to invest in farmer training, infrastructure, and certification systems that ensure consistent supply and quality.

Challenges

While Zimbabwe's passion fruit industry shows strong potential for growth and export, several challenges continue to undermine its competitiveness. These constraints are biological, climatic, and infrastructural, and they must be addressed if the country is to fully capitalize on rising global demand for tropical fruits.

The most pressing challenges are pests and diseases. Multiple studies highlight that fruit flies (*Ceratitis spp.*) and thrips (*Frankliniella spp.*) are among the most destructive insect pests affecting passion fruit production in Zimbabwe and across tropical regions. While Vikaspedia (2020) emphasizes their direct impact on fruit quality through scarring and premature drop, Ndiritu (2024) situates these pests within a broader framework of marketability challenges, noting that cosmetic damage significantly reduces export competitiveness. This convergence of evidence suggests that pest management is not merely a production issue but a critical determinant of international trade viability.

Viral infections, particularly the Cowpea Aphid-Borne Mosaic Virus (CABMV) that causes woodiness in passion fruits, further compound these challenges. Most (2026) underscores the persistence of soil-borne pathogens such as *Fusarium oxysporum*, which shorten plantation lifespans to three to five years. Taken together, these findings reveal a systemic vulnerability: passion fruit production in Zimbabwe is constrained by biological threats that simultaneously reduce yields and undermine compliance with phytosanitary standards required for export. This indicates that while individual studies focus on specific pests or pathogens, the collective evidence points toward an urgent need for Integrated Pest and Disease Management (IPDM). Without coordinated interventions, Zimbabwe's passion fruit sector risks stagnation, unable to capitalize on growing global demand for tropical fruits and functional foods.

Zimbabwe's competitiveness in passion fruit exports is significantly undermined by structural infrastructure gaps. For example, ZimTrade (2024) report highlighted that the absence of reliable cold chain logistics, particularly refrigerated transport and storage often results in high post-harvest losses, a critical issue given the perishability of passion fruit. This weakness not only reduces domestic supply but also erodes the country's ability to meet export demand consistently. Furthermore, the Netherlands Enterprise Agency (2020) report underscored the lack of large-scale processing facilities, which restricts opportunities for value addition through products such as juice concentrates, seed oil, and nutraceuticals. Without such facilities, Zimbabwe remains locked into low-value fresh fruit exports rather than capturing higher margins from processed goods.

Climate requirements present a significant challenge to passion fruit cultivation. Optimal growth occurs within a temperature range of 20-30°C and annual rainfall between 1000-1500mm conditions that are not consistently met across Zimbabwe's agro-ecological zones. The crop is highly sensitive to frost and prolonged drought especially during winter season, which can severely limit productivity. Studies confirm that climatic stress directly reduces fruit production and quality, particularly in smallholder systems where adaptive infrastructure is limited (Ordonez *et al.*, 2023). Furthermore, zoning assessments highlight that passion fruit cultivation is viable only in specific microclimates, underscoring the importance of site selection and climate-smart management strategies (Araujo et al., 2025). These findings demonstrate that without adequate irrigation, frost protection, and adaptive practices, passion fruit production remains vulnerable to climatic extremes, constraining

Zimbabwe's ability to scale up commercial production. Moreover, smallholder farmers, who form the backbone of horticultural production, face additional barriers in accessing international markets, for example weak certification systems and difficulties in complying with stringent European Union phytosanitary standards limit their participation in global value chains. Collectively, these constraints reveal a systemic challenge. Addressing these bottlenecks through investment in cold chain logistics, processing facilities, and farmer support for certification would be pivotal in repositioning Zimbabwe's passion fruit industry within regional and global markets.

Zimbabwe's passion fruit industry therefore has clear export potential, supported by relatively favorable agro-ecological conditions and rising global demand. However, competitiveness depends on overcoming these challenges. Strengthening farmer clusters, investing in irrigation and cold-chain systems, and improving phytosanitary compliance will be critical steps toward scaling exports. If these constraints are addressed, Zimbabwe could transform passion fruit into a cornerstone of its horticultural export diversification strategy.

FUTURE PROSPECTS OF PASSION FRUITS IN ZIMBABWE

Passion fruit (*Passiflora edulis*) holds significant promise for Zimbabwe's agricultural and industrial sectors. With global demand rising for nutrient-rich fruits and functional foods, the country can leverage advances in genomics, sustainable cultivation practices, and market expansion strategies to position passion fruit as a high-value crop.

1. Genomics-Assisted Breeding

Recent breakthroughs in genomics and biotechnology are transforming passion fruit improvement. Reference genomes have been sequenced, enabling identification of marker-trait associations for yield, disease resistance and fruit quality (Fulara et al., 2026). Techniques such as genomic selection, speed breeding and Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)-based editing are being applied to overcome challenges of cultivar decline and narrow genetic diversity. For Zimbabwe, integrating these tools into breeding programs could produce locally adapted cultivar to pests, diseases, and climate variability, ensuring long-term productivity.

2. Sustainable Cultivation Practices

Sustainability is central to future horticulture. Passion fruit thrives under integrated soil fertility management, organic amendments and water efficient irrigation systems. Practices such as intercropping with legumes, mulching and Integrated Pest Management (IPM) reduce reliance on synthetic inputs while improving soil health (Dantas *et al* 2019) In Zimbabwe, smallholder farmers can benefit if they adopt intercropping passion fruits with other crops.

3. Market Expansion and Value Addition

The global passion fruit market is projected to grow steadily, driven by demand for juices, concentrates, nutraceuticals and cosmetics (FAO, 2020). Zimbabwe has already entered export markets, with consignments shipped to the United Kingdom (The Herald, 2021).

Expanding processing capacity for juices, herbal teas, cordials and seed oil will enhance value addition, create employment, and increase foreign currency earnings. Developing cold chain infrastructure, certification systems and branding strategies will further strengthen Zimbabwe's competitiveness in regional and international markets.

CONCLUSION

The literature reviewed demonstrated that passion fruit production in Zimbabwe holds considerable promise, both for domestic value addition and international trade. Locally, farmers are adopting improved farming practices such as trellising, grafting, and integrated pest management, which have boosted yields and created opportunities for smallholder participation. Industrial applications are expanding, with companies and small enterprises processing passion fruit into juices, jams, and even seed oil for cosmetics, highlighting its versatility across food, beverage, and skincare industries.

On the global stage, Zimbabwe has begun exporting passion fruit to South Africa, Portugal and United Kingdom signaling its competitiveness in niche markets. However, challenges remain: pests and diseases such as Fusarium wilt and fruit flies reduce yields, climate requirements limit production zones, and infrastructural constraints particularly irrigation and cold-chain logistics hamper large-scale commercialization.

Overall, Zimbabwe's passion fruit sector is at a transitional stage. it has the agro-ecological conditions and market demand to thrive, but scaling requires investment in farmer training, disease-resistant planting material, processing facilities, and export infrastructure. Addressing these constraints will enable Zimbabwe to position passion fruit as a competitive horticultural export contributing to agricultural diversification and rural livelihoods.

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