

A Voluntary Sustainability Standards Guidebook for Vanilla in Papua New Guinea



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Note

All data and prices used throughout this guide are based on 2023 and are subject to change. Users are advised to verify any information and consult with relevant authorities, organizations, or professionals before making decisions related to the export process, certification, or pricing strategies. This guide is for informational purposes only and does not constitute legal, financial, or professional advice.

The term “dollar” (\$) refers to United States dollars unless otherwise specified.

Abbreviations and acronyms

CSR	Corporate Social Responsibility
DAL	Department of Agriculture and Livestock (Papua New Guinea)
GFSI	Good Agricultural Practices Global Food Safety Initiative
HACCP	Hazard Analysis Critical Control Point
IDH	Initiatief voor Duurzame Handel (= Sustainable Trade Initiative)
IFS	International Feature Standards
ISO	International Organisation for Standardization
MRL	Maximum Residue Level
NAQIA	National Agriculture Quarantine and Inspection Authority (PNG)
NARI	National Agriculture Research Institute (PNG)
NGO	Non-Governmental Organisation
NISIT	National Institute of Standards and Industrial Technology (PNG)
SME	Small and Medium Enterprise
SQF	Safe Quality Food
SVI	Sustainable Vanilla Initiative
USDA	United States Department of Agriculture
VSS	Voluntary Sustainability Standards
WTO	World Trade Organisation

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Introduction

This report offers an overview of Voluntary Sustainability Standards (VSS) and their potential impact on the vanilla industry in Papua New Guinea. VSS, encompassing certifications and standards for sustainable commodity production, can contribute to the promotion of sustainable practices and enhance market access, potentially boosting profits and incomes, especially for farmers.

The initial section of the report focuses on vanilla as a commodity, discussing the various types cultivated globally, their quality standards, trade flows, and the market's volatility. It then introduces VSS, exploring their significance and potential benefits not only to the vanilla industry but also to the broader agricultural sector. This section emphasizes the growing influence of health-conscious, environmentally and socially aware consumers worldwide, alongside governments' increasing incorporation of sustainability into legislation. These developments necessitate adaptation by farmers and others in the vanilla value chain.

Further, the report provides an overview of Papua New Guinea's vanilla sector and its value chain, highlighting how VSS pose both challenges and opportunities. The final section offers recommendations for the government and private sector to enhance the competitiveness, attractiveness, and sustainability of Papua New Guinea's vanilla industry. It emphasizes the role of smallholder farmers, underscoring that strengthening the sector can lead to more inclusive growth.

Why focus on vanilla in Papua New Guinea?

The global vanilla market size was valued at US\$ 2,854.99 million in 2021. It is projected to reach US\$4,701.91 million by 2030, growing at a *Compound Annual Growth Rate* of 5.7 per cent from 2022 to 2030 (Straits Research, 2022). In contrast, the vanilla market in Papua New Guinea was valued at 29.9 million Kina, or about US\$ 8.4 million, in 2021 (Tridge, 2023). This accounts for only 1.4 per cent of the country's export value, a small figure when compared to other agricultural commodities like palm oil, coffee, and cocoa.

For context, 85 per cent of the population in Papua New Guinea are farmers. Many of them find traditional crops like coffee and cocoa to be bulky and difficult to transport to market. Vanilla offers an alternative, given its relatively high price and ease of transport, which is especially beneficial for communities in remote areas lacking basic infrastructure such as roads and airstrips.

Papua New Guinea ranks as the 5th largest vanilla producer in the world, holding 3.26 per cent of the global market in 2021 (Tridge, 2023), and is the largest exporter of *Vanilla tahitensis*. However, the country has a large capacity to produce more vanilla by increasing productivity and improving quality, which would support higher prices and a larger share of the market globally. For comparison, Madagascar leads the global market with 67.38 per cent of exports, generating US\$ 599 million in 2021, followed by Indonesia (FAOSTAT, 2023).

Enhancing the standards and reputation of Papua New Guinea vanilla through increased quality and consistency is expected to boost global demand and prices. Although adopting VSS may not always elevate prices in the vanilla market, VSS-certified vanilla is likely to capture a larger market share than "regular" vanilla.

Moreover, improving the economic conditions of Papua New Guinea's rural and remote communities can have broader environmental benefits. Vanilla cultivation offers livelihood opportunities that can improve resource use, thereby mitigating threats to biodiversity.



1. Vanilla as a commodity

1.1. A brief history

Vanilla belongs to a genus of orchid that is present natively across the tropics and contains in the region of 120 species, though only 20-30 of these species are known to be fragrant (Karremans *et al.* 2020).

The growing and usage of vanilla as a flavour and scent started about 800 years ago in the Totonac and Aztec civilizations of Mexico (Lubinsky *et al.*, 2008). Attempts to grow vanilla outside of Central America initially failed because the natural pollinator was absent. Hand pollination was discovered and by 1880 Madagascar was cultivating vanilla. Over a period of fifty years, Madagascar became the world's leading exporter, surpassing even Mexico. Indonesia briefly became the main producer of vanilla in the 1990s, but today Madagascar once again accounts for around 60 per cent of the world production. Indonesia, China, Mexico and Papua New Guinea, with Uganda are the other largest producing countries. Table 1 shows the vanilla species grown world-wide for food export.

Globally, 90 per cent of the vanilla traded comes from a single species, *Vanilla planifolia* (formally known as *Vanilla fragrans* until 2000), with a second species, *Vanilla tahitensis* making up 9 per cent. Other vanilla species are traded globally, but in much smaller volumes: *Vanilla pompona* (from Mexico, Central America and Northern South America) and *Vanilla cribbiana* (from Mexico, Guatemala and Colombia).

Table 1. **Vanilla species grown world-wide for food export**

Common Name	Trade Name/s	Scientific name	A brief history (origin, species grown and location)
VANILLA	Tahitian Vanilla		<i>Vanilla tahitensis</i> J.W. Moore
	Vanilla / Planifolia Vanilla / Bourbon Vanilla		<i>Vanilla planifolia</i> Jacks. ex Andrews
	Vanilla maya		<i>Vanilla cribbiana</i> Soto Arenas
	Odoriferous Vanilla		<i>Vanilla odorata</i> C. Presl
	Vanilla Pompon		<i>Vanilla pompona</i> Schiede

Source: Adapted from Lubinsky *et al.* (2008).

1.2. Vanilla planifolia and Vanilla tahitensis

The two species, *V. planifolia* and *V. tahitensis* are quite different in their biology, harvesting and aromatic profile. *V. planifolia* is native to Mexico whereas *V. tahitensis* does not exist in the wild but is a hybrid species whose parents are still debated, either *planifolia* x *odorata* (Lubinsky *et al.* 2008), or *sotoarenasii* x *odorata* (Favre *et al.* 2022).

The two species have very different aromatic profiles (*i.e.* aroma and flavour) (Brunschwig *et al.* 2009). The base note of their smell comes from vanillin in both species, but in different amounts: 1.6-3.6 per cent (dry weight) for *V. planifolia* and 0.8-2 per cent for *V. tahitensis*. However, fourteen different phenolic compounds (and countless other fragrances) contribute to the smell of vanilla, not just vanillin. And in that respect, *V. tahitensis* has a more complex and richer smell than *V. planifolia*, with a total phenolic concentration of 4.2-5.1 per cent vs 2.1-4.2 per cent respectively, and several phenolic compounds that are not present in *V. planifolia*. Regional variations in aroma profile also exist both for *V. planifolia* (Ranadive 2006) and *V. tahitensis* (Brunschwig *et al.* 2016, Busconi *et al.* 2017) most likely due to different growing environments and curing methods.

1.3. Quality standards

Vanilla is the second most expensive spice in the world after saffron. This high cost is due to the time it takes to produce the finished product. Vanilla is labour intensive; every flower is hand-pollinated individually. It takes 9 months to grow a vanilla pod plus continuous effort over another 3 to 6 months to develop the flavour and aroma of vanilla.

Exporters and aggregators, and to a much lesser extent middle buyers, will keep the beans they buy for weeks if not months in tightly packed boxes to develop the flavour further, a process called conditioning.

When they are ready to be sent to clients, beans can either be packed tightly in wax paper within cardboard boxes or in vacuum bags.

Grading: There are currently no world standards for vanilla grading. Gradings are based on visual appearance, moisture content, vanillin content and aroma. Different customers usually ask for different specifications (See Annex 3 for a comparison of the general grading for Madagascar and Papua New Guinea).

Visual appearance and aroma can help a farmer without equipment to grade vanilla. Generally, the higher grades are black with no blemishes, straight with a well-formed hook, supple, have good oil and a moisture content of 25-35 per cent. Poorer grades have less oil, maybe marks on the skin, are split on the ends, and can be brittle. In most export countries, vanilla that is below 15cm is graded as a lower grade and longer beans attract a higher price. All vanilla sold should meet international food standards and have no mould, fungal growth or bacteria.

Moisture content is relatively easy to measure and requires only minimal training. It involves grinding the vanilla samples and placing them into a moisture content machine. Vanillin content is also relatively simple to measure, but most clients request an accredited independent laboratory assessment.

Vanilla also needs to be tested for contaminants such as pesticides, heavy metals (absorbed from the soil), and nicotine. Meeting maximum residue levels limits (MRLs) for food safety standards is a key factor to be able to enter international markets.

1.4. Vanilla usage in industry

Vanilla is mainly used in food, perfumery and pharmaceutical products. In all of these applications, vanillin is the principal compound of interest, even though vanilla is a very complex mixture of several hundred compounds, twenty of which contribute significantly to its smell, taste and medicinal properties.

In food, vanillin is mainly used in sweet products, such as puddings, custards, cakes and tarts, biscuits, ice creams, yoghurts, chocolate, toffees, confections, milk-based drinks and soft drinks to name only the major ones. In perfumery, it is used in luxury perfumes, but also in scented candles or soaps. In pharmaceutical products, vanillin is used to mask the taste and smell of other ingredients in the product but has also been used directly for its putative medicinal effects.

Vanillin extracted from vanilla remains however very expensive and most industrial applications are using synthetic vanillin. It can be chemically derived from guaiacol (typically derived from fossil hydrocarbons), eugenol (clove oil) and lignin (e.g. extracted from wastes of the paper industry), or synthesised by microbes (bacteria, yeast or fungus) using ferulic acid (from bran), glucose (from corn) or curcumin (from turmeric) as a substrate (Havkin-Frenkel, 2018). Only vanillin biosynthesised by microorganisms or extracted from vanilla can be legally called natural vanillin. All the other types of vanillin that require a chemical process must be labelled as synthetic vanillin. Vanilla extract must be made with vanilla, whereas an essence is made with vanillin that does not come from vanilla.

Less than 1 per cent of the vanillin used globally is sourced from vanilla (50 tonnes of vanilla-based vanillin out of a global market of 20,000 tonnes of vanillin). That is because it is far too expensive (from 1,000 to 30,000 US\$/kg depending on the price of vanilla) compared to the other sources of vanillin: guaiacol (10-20 US\$/kg), lignin (10-50 US\$/kg), eugenol (50-100 US\$/kg), curcumin (50-250 US\$/kg) and ferulic acid (400-600 US\$/kg).

Vanilla tends therefore to be used in high-end expensive products (e.g., luxury chocolates, hand-made desserts, premium ice creams and perfumes).

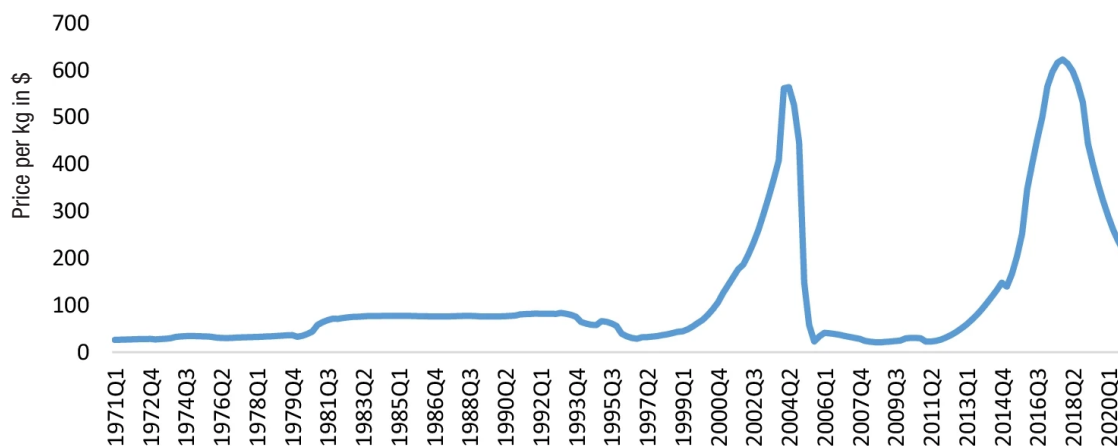
1.5. Vanilla trade

Vanilla as a raw product and commodity is traded internationally in four different forms: (1) whole beans, (2) cut beans, (3) ground beans and powder, and (4) caviar (seeds and fleshy pulp without the skin). Three broad categories of industries buy vanilla pods as a raw material. First are wholesalers who supply the retail sector (supermarkets, spice merchants, food specialists), second are small “industries” using vanilla directly as a raw ingredient for their products (hand-made ice creams, artisan chocolate, high-end restaurants, etc). And third (but probably the largest in volume bought) are the large processing companies, producing vanilla extracts (in a mixture of ethanol and water) that can then be used by other industries or the retail sector. For vanilla producing countries, it is interesting to diversify the types of vanilla products they sell to cater to all the needs of international markets.

1.6. Price fluctuations

Vanilla is an exceptionally volatile commodity due to its complete liberalisation on world markets (de Melo *et al.* 2000). Over the last 50 years, vanilla has usually been sold internationally at a price hovering between US\$ 20 and US\$ 80 per kilo. However, there have occasionally been increases in price for a few years when demand outstripped supply (culminating in a price that reached US\$ 500-600 per kilo, see Figure 1). These high prices are not sustainable and usually drop within a few years. Over the last 50 years, the price of vanilla has exceeded US\$ 100 per kilo only twice, from 2000 to 2004 and then from 2015 to 2022.

Figure 1. Price fluctuations of vanilla from 1971 to 2020 (VLN - global vanilla price)



Source: Khan *et. al* 2022.

The reasons for the increase in price are complex but combine political uncertainty (civil unrest in Madagascar), severe weather events (cyclones in Madagascar and/or Indonesia) and speculation (including money laundering), resulting in high prices being unpredictable, short-lived (5 to 6 years) and rare.

High prices attract various players to the vanilla trade. At the farmer level, the risk of theft in vanilla plots increases, prompting farmers to pick their beans before they are fully ripe. Early picking leads to beans that lack the necessary precursors for vanillin, resulting in vanilla with lower vanillin content. This, in turn, increases the likelihood of fungal growth and reduces the overall quality of vanilla in the market. Countries where early picking is a consistent issue usually face lower pricing for their vanilla.

When prices are high, farmers who had previously abandoned vanilla cultivation often return to it, leading to a global increase in supply. This oversupply eventually drives prices down, causing many farmers to abandon their vanilla plots once again. Those who can produce high-quality vanilla and are willing to accept lower prices can maintain a market presence. As some farmers exit the market, supply decreases, setting the stage for the next price boom.

2. VSS – The state of play

2.1. Voluntary Sustainability Standards

VSS are certifications and standards used to assure customers that commodities have been sustainably produced and meet a set of requirements that ensure sustainable production and consumption. VSS have been increasingly used as tools that can increase access to markets and thereby potentially improve profits/incomes.

There are many voluntary and mandatory standards set by different organisations at different levels:

- Multilateral standard ruling (e. g. World Trade Organisation) and multilateral standard-setting organisations (e. g. Codex Alimentarius).
- Supranational standard setting organisations (e. g. trading blocs such as the European Union).
- National standard setting organisations (e. g. European Union Member States).
- Private industry and trade (e. g. collective and corporate standards).

A single product may therefore have to reach several different standards at the same time to gain access to a market, e.g., the European Union market (see example in Table 1).

VSS are increasingly becoming important for producers, processors and distributors as their importance for competitiveness in international markets has significantly increased over time. For small to medium sized enterprises (SMEs), standards can help to:

- **Build customer confidence** that products are safe and reliable.
- **Meet regulation requirements** more efficiently.
- **Gain market access** across the world.

Table 2. **Voluntary and Mandatory standards a single product may have to meet to access a market in the European Union: An example**

PRIVATE STANDARDS	Voluntary - private company MARS, Nestle, Cargill IFS, HACCP ¹ , SQF, MRL, GFSI
NATIONAL STANDARDS	Mandatory European Union member country standards: quality, hygiene, MRL
SUPRANATIONAL STANDARDS	Mandatory European Union standards: quality, hygiene, MRL
MULTILATERAL STANDARDS	Voluntary UNECE- OECD
	Voluntary Recognised by WTO: CAC, IPPC, ISO

Source: Adapted from Will & Guenther (2007).

In VSS, the remit is usually broader than the mandatory standard for the product. It may, for example, include a measure on social justice ensuring producers get a fair economic reward for their labour. Other VSS may focus on the environment, while others may prefer to focus exclusively on child labour in the sector (in broad terms, e.g., education, labour, nutrition). VSS can also be a combination of quality, production, environmental and social metrics all designed to guarantee that products are produced in a certain way that reflects sustainability and therefore can be traded in the markets that demand for the same and are usually higher in value.

For VSS to be effective, they must be relevant to all stakeholders in the supply chain, including consumers and producers like farmers. Ultimately, any supply chain's success depends on supplying what the customers want. There is an increasing demand for sustainably produced goods by consumers globally, mainly in North America, Europe, Japan, Australia and New Zealand, as well as in some emerging economies. Increasing demand for sustainable goods has several origins, and it is useful to briefly review the seven main contributing factors.

1. Environmental concerns

Consumers are increasingly concerned about the negative impact of human activities on the planet and are therefore looking for ways to reduce their own ecological impact by modifying their own behaviour and shopping responsibly.

2. Safety standards

Consumers are increasingly aware that there is a link between their health and the environment. They pay attention to the quality and safety of products they consume, including food, cosmetics, and household

¹ The standards given are examples. HACCP is for instance imbedded in the European Union legislation and any exporter has to comply with it to send products to the region.

items. They view sustainable products as offering healthier alternatives, free from harmful chemicals and toxins.

3. Ethical considerations

Consumers are increasingly interested in the ethical implications of their purchasing decisions. They want to support companies and brands that demonstrate social responsibility, fair labour practices, and respect for human rights. They will support sustainability initiatives, such as fair trade and responsible sourcing, that align with their values and provide consumers with a sense of contributing positively to society.

4. Transparency and accountability

Consumers are demanding transparency and accountability from businesses (thanks to the ease of accessing information via the internet and social media) regarding their environmental and social impact. Sustainable practices and certifications are signalling transparency and can help build trust with consumers.

5. Law changes

Many countries and supra-national entities (e.g., the European Union) change laws on food safety standards and product specifications. For example, there are constantly changing laws in pesticides and MRLs, as well as environmental standards. These standards need to be assessed on a regular basis to ensure access to the market.

6. Generational shift

Younger generations have played a significant role in driving the sustainability agenda globally. These generations tend to be more environmentally and socially conscious, valuing sustainability as a core principle. Their purchasing power and influence, which can only grow over time, have pushed companies to prioritize sustainability and adapt their practices to meet the demands of these consumers.

7. Media coverage and advocacy

Sustainability-related topics have gained significant media coverage, ranging from documentaries to news articles. Influential figures, celebrities, and activists have also raised awareness about sustainability issues and promoted eco-friendly lifestyles. This media attention and advocacy have played a crucial role in shaping consumer attitudes and pushing forward the sustainability agenda.

Not all of these factors may be important to all markets, but for high value niche products it is generally expected that sustainable quality standards will increase and be more in demand over time.

2.2. Current initiatives

The sustainable vanilla trade has gained significant attention due to its economic and environmental importance. There are essentially three different types of initiatives. The first and better known one is for vanilla to be certified as a sustainable product according to a precise set of standards (such as Organic, Fairtrade or Rainforest Alliance).

The second is for whole companies to be certified for their Corporate Social Responsibility (CSR), after demonstrating their overall sustainability performance and impact across their operations, supply chain, and stakeholder engagement. These two initiatives are independent but not mutually exclusive, in that some companies may decide to gain a CSR certification overall on the one hand, and on the other, get one or more sustainability certifications for the products they trade or use.

The third initiative is not based on certificates, but instead on building public-private partnerships to support the trade of sustainable vanilla. These collaborations involve governments, non-governmental

organizations (NGOs), companies, and international organizations working together to provide training, technical assistance, and market access for vanilla farmers. Such partnerships aim to improve the livelihoods of farmers, strengthen supply chain transparency, and promote sustainability in the vanilla industry. Overall, these three types of initiative aim to address social and economic challenges, improve farmer livelihoods, conserve biodiversity and promote responsible sourcing throughout the vanilla supply chain.

For vanilla, the main certifications that can be obtained are: Organic, Fairtrade and Rainforest Alliance. These certifications, while keeping true to their original focus, have gradually converged and overlap in many ways. A significant benefit of these certifications is their regulatory framework, ensuring that vanilla complies with uniform standards worldwide. It therefore provides a guarantee to consumers about the product's quality and sustainability (see Annex 1).

Organic Vanilla Certification ensures that vanilla is grown without synthetic fertilizers, pesticides, or genetically modified organisms. Organic farming practices promote soil health, biodiversity and ecological balance. They also provide full traceability from the farm to the consumer. Organic certification organizations, such as the United States Department of Agriculture (USDA) Organic or the European Union Organic logo, provide standards and labels for organic vanilla products, enabling consumers to choose environmentally organically grown products. In most markets, it is not possible to claim “organic” certification without an independent certifier.

Fairtrade Vanilla Certification ensures that vanilla farmers receive fair prices for their produce and that environmental and social standards are met. Fairtrade supports sustainable farming practices, fair wages, and community development initiatives.

Rainforest Alliance Certification ensures that vanilla is produced according to rigorous sustainability criteria and that it minimizes environmental impact (on pre-existing forests), protects biodiversity, conserves natural resources, and provides social benefits to farmers and workers. They have a specific certification for herbs and spices. The label however has limited use for vanilla unless sold directly as vanilla. If there is another ingredient in the product that also has rainforest alliance certification, for example, in a chocolate bar, the label could not be used unless the cocoa was also certified due to minimum content requirements for label use. There is also a participation royalty of US\$1,250 per metric tonne of vanilla paid by the customer which could negatively affect the market.

Among the CSR certifications, the “B Corporation” is noteworthy, although not specifically tailored to the vanilla industry. This certification program serves to assist corporations in assessing their own practices. Through audits, these corporations are guided on improving their social and environmental policies.

Finally, four examples of public-private partnerships focusing on sustainable vanilla production are listed, all based in Madagascar:

(1) the Sustainable Vanilla Institute (SVI), established in 2015, involves a public organization, IDH (the Sustainable Trade Initiative), 32 private companies, and an NGO (Sustainable Food Lab) working together to promote the long-term stability and sustainability of the vanilla sector and drive positive change in the vanilla industry in Madagascar and Uganda.

(2) Prova, a flavour and ingredient company, and the private Livelihoods Fund for Family Farming (L3F) add a focus on reforestation and biodiversity conservation.

(3) Symrise (a global fragrance and flavour company), Unilever (a consumer goods company), and GIZ (German Agency for International Cooperation) aim to also empower women, support reforestation efforts and conserve biodiversity in Madagascar; and

(4) Danisco (now part of DuPont), IDH and Save the Children to establish the Vanilla for Change program in Madagascar, which aims to improve the livelihoods of vanilla farming communities and access to healthcare and education for farmers' families. There is currently no equivalent public-private partnership in Papua New Guinea.

2.3. Adoption

The adoption of sustainable certifications among vanilla suppliers has been increasing in recent years as consumer demand for sustainable and responsibly sourced products has grown. However, there seems to be a difference in adoption between the retail sector (that sells vanilla beans directly to consumers) and the "industrial" sector that produces vanilla extracts or uses vanilla directly in its products.

In the retail industry, consumer demand for certified vanilla, encompassing organic, fairtrade, and rainforest alliance labels, is increasing steadily, largely due to its effectiveness as a marketing tool. Conversely, in the industrial sector, the emphasis on certified vanilla is not as prevalent. The situation regarding the need for certified vanilla in products is variable and heavily depends on the source market. It is crucial for manufacturers and suppliers to engage in thorough discussions with their customers to ensure that the product meets their specific requirements. The landscape of organic certification is rapidly evolving, particularly in the context of products that are labelled as organic based on their ingredients. This evolution highlights the importance of staying informed and adaptable to meet the changing standards and expectations in different markets.

The current trend is that many companies involved in the industrial sector have opted to join public-private partnerships, such as the Sustainable Vanilla Institute, rather than certification programs. This is likely to continue in the foreseeable future unless new regulations force change in the market.

2.4. Potential benefits

Sustainability initiatives offer several potential benefits to farmers in the vanilla industry. While the specific benefits can vary depending on the certification and the context, here are some commonly recognized advantages.

Price premium. Sustainable certifications often enable farmers to receive a price premium for their certified products. Certifications like Fairtrade, Rainforest Alliance, or organic, signal to consumers that the vanilla has been produced according to certain standards, which can result in higher prices in the market. Generally, this could help farmers earn better incomes and improve their financial stability. However, this potential price premium will be dependent on the state of the market (boom or bust) and on the sector targeted (retail or industrial). When the price is high (boom year), it is unlikely that certified vanilla would receive a premium, and even if it does, it would not amount to much. When the price is low, the price premium is more likely to add value and may give farmers the intended uplift in price. However, increase in pricing is most likely to occur when the client is from the retail sector, because they can benefit from the certification directly in their marketing. The industrial sector is unlikely to pay any price premium regardless of the price of market except when asked by their end user. Nevertheless, industrial clients are more likely to preferentially buy certified vanilla over other (non-certified) vanilla in the marketplace.

Market access and demand. Sustainable initiatives often provide farmers with improved market access and increased demand for their products. Many consumers actively seek out sustainably certified products, creating opportunities for certified farmers to tap into niche markets and secure stable buyers. Certification can help farmers differentiate their products, attract responsible buyers and establish long-term relationships with businesses that prioritize sustainability.

Capacity building and training. Sustainable initiatives often include capacity building and training programs for farmers. These programs provide technical assistance, knowledge, and resources to improve farming practices, crop quality, and productivity. Farmers gain access to training on sustainable agricultural techniques, efficient resource management, and biodiversity conservation. This can enhance the skills and knowledge of farmers, leading to improved yields, reduced environmental impact, and long-term sustainability. A focus on quality will also contribute to the long-term success and survival of their business when prices are low.

Social and community development. Many sustainable initiatives emphasize social development aspects. They support community projects and initiatives aimed at improving living conditions, healthcare, education, and infrastructure in farming communities. Farmers may benefit from initiatives such as schools, healthcare facilities, clean water projects, and fair labour practices, enhancing the overall well-being and quality of life for themselves and their families.

Environmental stewardship. Sustainable initiatives often require farmers to adopt environmentally friendly practices. This includes measures to conserve soil health, protect biodiversity, avoid chemical inputs, and promote sustainable land management. By following these practices, farmers contribute to environmental stewardship, preserve natural resources, and mitigate the negative environmental impacts of farming activities.

These potential benefits of sustainable initiatives provide farmers with economic, social, and environmental advantages. They can help improve livelihoods, create market opportunities, enhance skills, and promote sustainable agricultural practices within the vanilla industry.

3. Analysis of the vanilla value chain in Papua New Guinea

3.1. Overview of vanilla production in Papua New Guinea

Papua New Guinea distinguishes itself in the in the global vanilla market by cultivating and trading both dominant species, *V. planifolia* and *V. tahitensis*. The only other country to do so is Indonesia. This capability allows Papua New Guinea to diversify its range of vanilla products, potentially creating new international markets.

Vanilla is produced in about half of the 22 provinces of Papua New Guinea, mainly on the north coast in the MOMASE region (Morobe, Madang and Sepik provinces) (Coote *et al* 2019). However, close to 80 per cent of the vanilla produced in Papua New Guinea comes from the East Sepik province alone and more specifically the Maprik and Ambunti/Dreikikir districts.

Indonesia is a major importer, receiving about 50 percent of Papua New Guinea's vanilla production. Access to higher-priced markets in Europe, the United States of America, and Japan exists but requires meeting stringent quality standards. These markets represent a lucrative opportunity for expansion, provided that the quality challenges are addressed (See Table 3 for Papua New Guinea export values).

Table 3. Export value of Papua New Guinea vanilla exported per country from 2014-2021

Destination	Value of export by destination (in thousands of United States dollars)							
	2014	2015	2016	2017	2018	2019	2020	2021
World	2 800	5 900	16 200	30 000	46 000	38 000	40 000	29 400
Indonesia	-	682.1	492.9	3 200	9 900	5 100	20 100	14 100
United States of America	519	933.2	3 300	8 000	8 200	7 100	4 600	4 700
Australia	1 400	1 900	2 300	3 400	6 100	4 600	5 000	3 000
France	526.3	929.3	3 800	5 800	5 600	7 600	2 000	3 000
United Kingdom	159.9	152.3	580.7	1 100	1 200	853.7	332	1 000
Germany	-	632.1	3 600	4 600	8 300	5 700	3 300	1 400
Canada	24.7	231.2	495	1 100	2 000	3 100	877.1	663.3
Switzerland	-	0.652	49.5	328.4	1 000	655	505.5	230.1
New Zealand	79.9	169.1	264	291.3	709.6	627.3	347.5	93.3
Belgium	-	-	-	-	13.4	274.1	424.9	1.7

Source: Tridge, 2023.

A value chain assessment in 2017 (Coote *et al.* 2019) estimated that at least 110 tonnes was exported informally (*i.e.*, without quarantine and customs authority) through the Indonesian border at Wutung near Vanimo. This has to be compared with an estimated production of 495 tonnes for the whole country (SPC, 2021). The probable reason for this substantial informal trade is the proximity of many vanilla producers to the lengthy and sparsely populated 824km land border with Indonesia, making cross-border trade more accessible than reaching Papua New Guinean coastal markets.

Despite Papua New Guinea producing high-quality vanilla, several issues challenge its position in the global market. One significant issue is the prevalence of mould contamination, often a consequence of early harvesting and inadequate storage practices. Additionally, residues from pesticides – some of which are banned in other countries but still used in Papua New Guinea – pose a major concern. Another complicating factor is the presence of nicotine in the vanilla, typically resulting from substandard drying and handling practices, such as using open fires in village settings for drying. These issues collectively not only degrade the quality of Papua New Guinea's vanilla but also substantially limit its ability to compete in the global market. Addressing these challenges is paramount for Papua New Guinea to not only enhance the quality of its vanilla but also to expand its reach and influence in the international market. This is particularly crucial as most actors within the Papua New Guinea vanilla supply chain tend to sell their beans with minimal processing or conditioning.

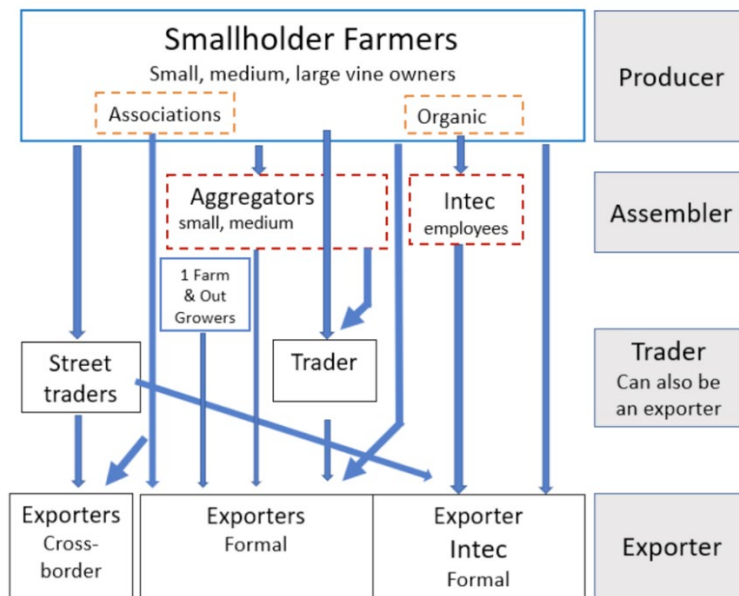
3.2. Actors in the vanilla value chain in Papua New Guinea

Understanding the challenges in Papua New Guinea's vanilla industry requires an examination of the various actors in its supply chain. The vanilla supply chain can be conveniently divided into two tiers, the first tier produces vanilla in small farms and the second buys and sells vanilla (see Figure 2). However, a multitude of practices and pathways are evident in the chain (Coote *et al.* 2019).

Farmers can be divided arbitrarily into three categories, depending on the size of their vanilla plots (less than 300 vines, 300 to 900 vines, and more than 900 vines). A survey of 100 such farmers in Maprik district (Coote *et al.* 2019) showed that small-scale farmers achieved higher yield (about 67 grams of cured vanilla per vine) but a lower proportion of grade A vanilla (22 per cent) than medium-scale (16 grams of cured vanilla per vine and 55 per cent grade A) and large-scale farmers (11 grams of cured vanilla per vine and 40 per cent grade A). In terms of volume produced overall by these three categories of farmers, the volume estimated was similar but increased slightly with the scale of the farmer: from 64 tonnes for

small-scale farmers, to 73 tonnes for medium-scale farmers and 103 tonnes for large-scale farmers. Medium- and large-scale farmers tend to be established vanilla growers with several years of experience, while small-scale farmers are likely to be relatively newcomers, with less experience in growing and curing vanilla.

Figure 2. Vanilla value chain in Papua New Guinea



Source: Coote et al. 2019.

Associations and Cooperatives. Farmers sometimes organise themselves into associations and cooperatives in order to streamline the sale of their combined vanilla, either in-country to the single large or the few medium exporters, or directly to a client abroad (including on the Indonesian border). However, few associations and cooperatives seem able to operate for more than a few years, and many become dormant. Unfortunately, for every success story there are many failures. Operating as an exporter requires a different skill set than that required for growing and curing vanilla. The export guide for vanilla, prepared alongside this VSS assessment, outlines the opportunities, risks and challenges that await an exporting business to prosper.

Middlemen (also called traders) buy vanilla from farmers in town (Maprik, Madang, Lae) or directly within villages. They can also buy vanilla from other middlemen and then resell to the exporter, formal or informal, that offers them the highest and quickest return.

Aggregators are operating similarly to middlemen, but on behalf of an exporter (large or medium), sometimes even an importer abroad, in exchange for a commission on the volume they bring.

Exporters vary in size from large operators to SMEs but are responsible for exporting vanilla out of the country, either to the Indonesian border or to international clients. These actors are ultimately responsible for the reputation of Papua New Guinea vanilla on the international market. Quality control is critical at this stage, to make sure that what is sent to the market matches the client's needs.

Each actor in the supply chain tries to maximise their profit margin and access as much volume as they can cope with. This leads naturally to short and consolidated supply chains. The shortest possible chain involves farmers selling directly to an exporter or organising themselves and becoming exporters. However, the lack of infrastructure (specifically roads) in many parts of the country means that middlemen

still have a huge foothold in the supply chain. Even farmers who make the effort to come to town to sell their vanilla end up selling it to middlemen because they do not want to wait in a long queue to access the exporter directly.

3.3. Other stakeholders in Vanilla

The Investment Promotion Authority (IPA) is responsible for the registration of all companies in Papua New Guinea, which includes therefore cooperatives, vanilla buyers, processors and exporters. In addition, it keeps a record of the economic activity of all these companies every six months.

The Internal Revenue Commission (IRC) is responsible for the taxation of all companies in Papua New Guinea, whether it relates to salary and wages (SWT), goods and services (GST), or income. It also delivers Tax Identification Numbers (TIN) to companies for proper record keeping.

The Department of Agriculture and Livestock (DAL) is responsible for the vanilla sector and for the Spice Industry Board at the national level. Agricultural officers in several districts across the country are also supporting the vanilla sector (especially with training on growing and curing). DAL also takes part in the CODEX ALIMENTARIUS and ensures that international standards consider Papua New Guinea vanilla trade as well as Papua New Guinea policy and systems supporting upholding standards for export.

The Spice Industry board (SIB) primarily delivers licenses to operate as an exporter (renewed annually), compiles statistical data on production, imports and exports and keeps a register of all licensed buyers, processors (*i.e.*, manufacturers) and exporters. It is also tasked with promoting the exports of all spices, as well as research and development programmes, and with regulating the spice industry.

The National Agriculture Quarantine and Inspection Authority (NAQIA) provides quarantine and inspection services at all ports and issues phytosanitary certificates that are mandatory for every single vanilla export (even a small sample). There are no clear guidelines for tourists to export small quantities, nor samples sent out for destructive testing. At present, the certificates are purely based on visual inspection for signs of moulds and foreign bodies.

Customs are responsible for checking that all necessary documentation for export has been provided and checked before agreeing that vanilla can leave the country. It should, in addition, ensure that any claim of VSS at export is backed-up by the appropriate documentation (e.g. certificate).

The National Agriculture Research Institute (NARI) has produced several booklets for farmers that cover a wide range of vanilla topics from cloning to pruning to processing. NARI also has a laboratory that is able to test for vanillin content (HCLP), chemical analyses (quality tests) as well as microbial and fungal contamination (food safety testing).

The National Institute of Standards and Industrial Technology (NISIT) assumes several core responsibilities in developing national standards, in accrediting Conformity Assessment Bodies and in supporting Papua New Guinea businesses to get certifications.

4. Challenges and opportunities of VSS adoption for the Papua New Guinea vanilla sector

This section examines the opportunities represented by the adoption of VSS in the vanilla sector of Papua New Guinea. It highlights the significant challenges, including financial barriers, limited awareness, and cultural factors faced by farmers. Concurrently, the text identifies potential opportunities, such as financial support, educational programs, and market access improvements. The analysis provides an overview of the factors influencing sustainable practices in the vanilla industry, outlining both the obstacles and the paths forward.

4.1. Challenges

Getting farmers to follow Voluntary Sustainability Standards can pose several challenges.

Financial considerations. One of the primary challenges is the financial aspect. Adopting sustainability initiatives often requires additional investments in equipment, training and infrastructure. However, many small-scale farmers may lack the necessary funds to make these investments. The upfront costs can be a barrier for farmers to participate in VSS, especially if they do not see immediate financial benefits or if the certification premiums are not substantial enough to offset the costs.

Lack of awareness and training. Limited awareness and knowledge about sustainability practices can be a hurdle. Many farmers may be unfamiliar with the concepts of sustainable agriculture, environmental conservation, or social responsibility. They may not understand the potential benefits of certification or the long-term advantages of adopting sustainable practices. Education and awareness programs are essential to help farmers understand the value proposition of sustainability initiatives. Most initiatives require documentation to ensure full traceability. Many farmers are not in a position to record and monitor farms to the level that certification requires. Compliance is an area that needs specialist training, and modern approaches through agricultural technology may make it easier for farmer groups to be able to demonstrate compliance.

Access to resources and technical support. Farmers may face challenges in accessing the necessary resources and technical support to implement sustainability initiatives. This includes factors such as training programs, agronomic expertise, access to infrastructure (e.g., water management systems, road transport). Limited access to these resources can hinder farmers from successfully adopting sustainable practices and meeting certification requirements.

Market linkages and assurance of fair trade. Farmers may hesitate to participate in sustainability initiatives if they are uncertain about market linkages and the assurance of fair trade. They may worry about finding reliable buyers for their certified products or fear exploitation in the supply chain. Building strong market connections and ensuring transparent and fair-trade practices are crucial to instil confidence in farmers to participate in sustainability initiatives. Exporters also may not be convinced of a commercially viable business if the premium gained does not pay for the certification costs.

Cultural and traditional practices. Some sustainability initiatives may conflict with existing cultural or traditional farming practices. Farmers may have deep-rooted traditions, beliefs, or customary practices that may need to be reconciled with the requirements of VSS. For example, demonstrating gender equality is usually required in social and environmental certifications. Balancing sustainability goals with cultural considerations while respecting local knowledge can be complex.

Scale and logistics. Implementation of sustainability initiatives often requires coordination and collaboration among various stakeholders, including farmers, certification bodies, and supply chain actors. Scaling up sustainability initiatives across a broader region or multiple farming communities can be logistically

challenging. Ensuring consistent adherence to certification standards and maintaining traceability throughout the supply chain can be difficult, especially in areas with fragmented farming systems.

Addressing these challenges requires a multi-faceted approach. It is essential to provide farmers with the necessary incentives, resources, and support to overcome these challenges and facilitate their participation in VSS.

4.2. Opportunities

Several opportunities exist to support and encourage farmers in adopting VSS.

Financial support. Providing financial assistance, subsidies, or low-interest loans can help farmers overcome the financial barriers associated with adopting sustainability initiatives. Governments, development organizations and private sector entities can offer financial support to farmers, enabling them to invest in necessary equipment, infrastructure upgrades and training programs. If an exporter accepts to cover all certification costs (including renewals) and other ancillary costs (e.g. training, marketing), they may expect or in any case welcome some contribution towards these costs from the government (in the form of a subsidy) or from the farmers themselves (as a form of partial co-investment).

Capacity building and technical assistance. Offering capacity building programs and technical assistance can help farmers acquire the knowledge and skills needed to implement sustainable practices. Training sessions, workshops, demonstration farms, and farmer field schools can educate farmers about sustainable agricultural techniques, resource management, biodiversity conservation and certification requirements. Building farmers' capacity enhances their ability to adopt and maintain sustainable practices. While several training leaflets exist on the growing, maintenance and curing of vanilla (produced by NARI), there is nothing comparable on sustainable practices and certification requirements.

Market access and premiums. Facilitating market access and creating demand for sustainably produced goods can incentivize farmers to adopt sustainability initiatives. Collaborating with businesses, retailers, and certification bodies to promote sustainably certified products can help create a market niche for farmers. Branding Papua New Guinea vanilla as a quality and consistent product in trade and food events globally could improve market share for Papua New Guinea.

Partnerships and collaboration. Building strong partnerships between stakeholders along the supply chain is crucial. Collaboration among farmers, certification bodies, NGOs, government agencies, and private sector entities can foster knowledge sharing, resource pooling, and joint initiatives. Public-private partnerships can leverage the strengths of different stakeholders to provide holistic support to farmers, including access to training, technical expertise and market linkages. Such partnerships already exist in Papua New Guinea.

Knowledge sharing and peer learning. Creating platforms for knowledge sharing and peer learning among farmers can be valuable. Farmer networks, cooperatives, or community-based organizations can facilitate the exchange of best practices, experiences, and challenges related to sustainability. Farmers can learn from each other and collectively address common barriers to adoption.

Creating national institutional capacity to support farmers. One of the main issues for certifications is that there are no certifiers or auditors in the country. Bringing auditors from other countries into Papua New Guinea adds significantly to the costs of setting up a system as well as auditing. A proposed solution is that NISIT could, as part of their accreditation division, support local auditors obtain their credentials to develop more accessible local qualified certifiers.

5. Conclusion

Papua New Guinea has a favourable position to provide vanilla products that are organic, socially responsible, and environmentally certified. However, to take full advantage of this position, support from the government and capacity-building for farmers, SMEs, and larger businesses is required. This will allow producers to meet the higher-quality standards demanded by international markets.

In Papua New Guinea, farmers' valuation of the benefits from VSS varies. A premium price is highly attractive and crucial to them, regardless of the market's fluctuations. Gaining market access is also critical, particularly for those who experienced the market conditions between the boom periods of 2005 to 2014. While farmers expect capacity-building training, often at no cost, the importance of social and community development varies, with self-reliant farmers placing less value on it. In terms of environmental stewardship, most farmers hold strong opinions on land management and are open to advice that aligns with their traditional practices but may resist more aggressive interventions.

Meeting food safety standards and testing for vanillin and moisture content is integral to sustainable markets. Currently there is a lack of capacity in ports where exports can be processed and checked. Adding more resources in these areas will enable smoother and more effective export processes, aligning with international quality checks and standards.

Vanilla is a commodity that experiences large price fluctuations. Although it is a niche product with a relatively high price, Papua New Guinea does not enjoy the same pricing as other countries. Raising quality standards and facilitating voluntary sustainability standards should contribute to more consistent quality in vanilla which will attract more buyers to Papua New Guinea.

While the social and environmental certifications (such as Fairtrade and Rainforest Alliance) may be easier for Papua New Guinea producers to obtain, the large potential for organic certification in Papua New Guinea vanilla should not be overlooked. Organic production sustains soil, people and the environment. It is not just a declaration that products are free of chemicals and Genetically Modified Organism (GMOs). Every step of the chain needs to be documented and recorded until the product is in the packet on the shelf. Meeting the requirements of the certification schemes is unlikely to be difficult for most vanilla farmers, but the costs as well as maintaining the documentation for compliance are likely to be the biggest stumbling blocks.

A consideration for a body to help producer groups or export companies to maintain certification may reap widespread benefits from other commodity markets too. Markets generally do not require organic certification of vanilla due to the small volume used in the end products. However, the benefits are likely to be indirect. Papua New Guinea vanilla branded as better quality, certified and monitored should increase the appeal of Papua New Guinea vanilla on the global market, which would filter back to farmers receiving a higher price for their products (more because of the quality than the certification per se).

In light of the information provided in this report, a range of targeted policy recommendations has been formulated. These recommendations focus on strengthening the vanilla industry in Papua New Guinea by enhancing quality, traceability, and overall market competitiveness. By implementing these suggestions, the government can pave the way for a more robust, sustainable, and globally competitive vanilla industry.

Recommendations for government to support vanilla exports:

- 1. Develop local expertise:** Support the training of Papua New Guinea inspectors and auditors for sustainable certification bodies such as Organic, Fairtrade, and Rainforest Alliance.
- 2. Develop documentation templates:** Create templates to help businesses establish food standards and internal controls for VSS certifications.

3. **Enhance traceability:** Promote the development of agricultural technology that can be integrated with certification or organize trade fairs where farmer groups and businesses can explore different traceability methods.
4. **Update pesticide regulations:** Assess if those banned in Papua New Guinea match international standards (e.g. European Union and United States of America standards). Implement and promote the changes to signal to international markets that Papua New Guinean products will meet other nations MRLs.
5. **Strengthen testing labs:** Support multiple laboratories in Papua New Guinea to be able to test MRLs of pesticides and contaminants (e.g. heavy metals and nicotine) to meet import requirements of clients.
6. **Expand port testing:** Support a government body to develop capacity for microbial testing and vanillin content testing in every major port (Vanimo, Wewak, Madang, Lae, Kokopo, Port-Moresby, Buka).
7. **Assess export requirements:** Consider if a food safety certification standard, e.g. HACCP, should be made a compulsory requirement before an exporter license is granted in order to ensure that products meet food standards on export.
8. **Create a training booklet:** It will guide quarantine officers at NAQIA to ensure that quality standards are met at export.
9. **Develop a voluntary standard:** Create a voluntary quality standard for vanilla produced in Papua New Guinea.
10. **Contribute to CODEX:** Papua New Guinea should contribute to the new CODEX standard on vanilla.
11. **Source wax paper:** There is currently no supplier of food-grade wax paper in Papua New Guinea to support the export and conditioning of vanilla.
12. **Public-private partnerships:** Explore the possibility to establish a public-private organisation similar to SVI for Papua New Guinea.
13. **Promote Papua New Guinea branding:** Once new standards have been implemented, it is important to inform the market. A trade fair to attract international attention to new quality at export should expand trade opportunities.

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Annex 1

Current international vanilla standards

The International Organisation for Standardization has a standard for vocabulary to describe vanilla **ISO 3493:2014** where each type of vanilla product is described with a grade description.

ISO 5565-1:1999 Standards for *Vanilla fragrans* (Salisbury) Ames, syn. *Vanilla planifolia* Andrews. Applicable standards to vanilla in pods, bulk, cut or in the form of powder. It is not applicable to vanilla extracts.

ISO 5565-2:1999 Test methods for *Vanilla fragrans* (Salisbury) Ames, syn. *Vanilla planifolia* Andrews. (Table 4)

Table 4. **Current international standards for food testing applicable to Vanilla**

Spices	Provision	Method ^(1,2)	Principles
Vanilla	Moisture	ISO 939	Distillation
	Extraneous matter	ISO 927	Visual examination followed by Gravimetry
	Insect fragments	ISO 927	Visual examination counting
		AOAC 975.49	Flotation method
	Vanillin	ISO 5565	Distillation followed by HPLC or UV spectrophotometer
	Total ash	ISO 939 and ISO 928	Distillation followed by Gravimetry.
	Acid- insoluble ash	ISO 939 and ISO 930	Distillation followed by Gravimetry.

Source: ISO 5565-2:1999 Standards and Test Methods.

European Union standards: They are summarised on the CBI website and updated on a regular basis. For more information: <https://www.cbi.eu/market-information/natural-food-additives/vanilla-extract/market-entry>

CODEX Standards: Are currently being revised for vanilla.

Food standards. There are many different food standards, but the main idea is to identify and put in management and monitoring to prevent contamination. While microbial testing must be done on a regular basis to ensure processes are working, it typically takes too long to inform of an issue. Using chemical and physical tests in combination with observations should find any problems. Therefore, corrective actions should be put in place quickly to ensure that the defective product does not reach the market. Here are two food standards as an example:

The **IFS (International Feature Standards)** is a comprehensive certification program and management system: <https://www.ifs-certification.com>

The **HACCP- Hazard Analysis and Critical Control Point** is a management system that can be certified to look at risk and documentation for food production. These include hazard analysis, identifying critical control points, establishing critical limits, implementing and documenting monitoring procedures and corrective actions as well as a management plan to verify that the procedures are being followed and updated: <https://www.fda.gov/food/hazard-analysis-critical-control-point-haccp/>

Papua New Guinea voluntary standards. A voluntary guide for Papua New Guinea can be created in line with international standards to support the development of the vanilla industry. This will develop the industry to raise quality standards and to allocate resources to government agents to support the delivery of those standards.

Annex 2

Table 5. List of sustainability certifications that can be applied to support the development of the vanilla market in Papua New Guinea

<i>Certifying body</i>	<i>Contact details</i>
NASAA Certified Organic	PO Box 768 Stirling SA 5152 Australia Tel: +61 8 7231 7700 info@ncocertifiedorganic.com.au
ACO Certification Limited	Level 21, 12 Creek Street, Brisbane Queensland 4000 Australia (+61) 07 3350 5706 https://aco.net.au/Pages/ABoutUs/about.aspx
European Union Organic	https://agriculture.ec.europa.eu/farming/organic-farming/organics-glance_en
NOP (USDA)	https://www.ams.usda.gov
IFOAM Grower group	https://www.ifoam.bio/our-work/how/standards-certification/internal-control
Japanese Agricultural Standards (JAS)	Japanese Agricultural Standards Standards and Conformity Assessment Policy Office, Food Manufacture Affairs Division, New Business and Food Industry Department, Minister's Secretariat, Ministry of Agriculture, Forestry and Fisheries Tel: +81-3-6744-2098 Email: jas_soudan@maff.go.jp https://www.maff.go.jp/e/policies/standard/specific/organic_JAS.html
Rainforest Alliance	https://www.rainforest-alliance.org/business/certification/herbs-and-spices-program/
ECOCERT- Sustainable Wellbeing Centre	https://www.ecocert.com/en/certification-detail/sustainable-wellbeing-center
B Corporation	https://www.bcorporation.net/en-us/certification/
Fair trade	https://www.fairtrade.net/act/get-certified

Source: See contact details in columns.

Annex 3

Grading: When setting standards for vanilla exports, it is important to note that there is a market for most qualities. Table 6 and 7 outline the typical gradings in Madagascar and Papua New Guinea. Customers have the flexibility to select the desired quality of vanilla. It is therefore essential that the government from exporting countries ensure that there are no moulds, contaminants or pesticides and that their vanilla exports meet basic food standards.

Table 6. Madagascar grading

<i>Grade</i>	<i>Size</i>	<i>Colour</i>	<i>Marks</i>	<i>Moisture %</i>	<i>Vanillin %</i>
Gourmet	>18 cm	black	none	25-35	>1.8
Shorts	<15 cm	black, brown	some	25-35	>1.4
European Red	any	brown	some	18-25	>1.4
American Red	any	red stripes along bean	Larger marks	18-25	>1.2
Vrac (splits, cuts)	any	any	any	<18	any

Table 7. Papua New Guinea grading

<i>Grade</i>	<i>Size</i>	<i>Colour</i>	<i>Marks</i>	<i>Moisture %</i>	<i>Vanillin %</i>
A	>18 cm	black	none	25-35	>1.8
B	<18 cm	black, brown	small	25-35	>1.4
C	short	brown	small	18-25	>0.8
D	any	red stripes along bean	Large marks	18-25	>1.0
Rejects (mixed and includes mould)	any	any	any	any	any