

Assessing the Feasibility of Digitising the Kava Value Chain in the Pacific



The Commonwealth

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Acronyms and Abbreviations

ACIAR	Australian Centre for International Agricultural Research
ADF	Alcohol and Drug Foundation
AOC	Agricultural Occupancy Conditions
CAPI	computer-assisted personal interviewing
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement (Agricultural Research Centre for International Development)
CMV	cucumber mosaic cucumovirus
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FOB	free on board
GDP	gross domestic product
HACCP	Hazard Analysis and Critical Control Point
IT	information technology
NGO	non-governmental organisation
PACCOICOP	Pacific Classification of Individual Consumption According to Purpose
PARDI	Pacific Agribusiness Research in Development Initiative
PFIP	Pacific Financial Inclusion Programme
PHAMA Plus	Pacific Agricultural Market Access Plus
PICTS	Pacific Island Countries and Territories
PIFS	Pacific Island Forum Secretariat
SPC	The Pacific Community
SPE	South Pacific Elixirs
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
USAID	United States Agency for International Development
WHO	World Health Organization

Executive summary

The economic analysis undertaken in this report highlights that kava is a unique crop in the Pacific, both economically and socially. It has been used across the region for centuries as a core part of cultural ceremonies and events, and in recent years has become increasingly important from a development perspective. There are thriving domestic markets across the Pacific, providing an income to a high proportion of the populations, and export markets are growing, with the combined value of kava exports of Fiji, Tonga and Vanuatu growing by 520 per cent between 2012 and 2020. Kava is now the largest merchandise export in Tonga and Vanuatu, and Fiji's largest agricultural export.

In recent years, particularly in the run-up to the COVID-19 pandemic, high prices for kava, caused by rising global demand and limited supplies, have led to extremely high returns for farmers, often far beyond what other crops can return. This in turn has incentivised farmers across the region to plant kava in ever-increasing quantities – including in Samoa and the Solomon Islands. The market is therefore in a position of rapidly rising supply. Given kava's role in the economies of the Pacific, the question of whether sufficient demand can be found for this increasing supply is one of the key economic questions of the decade for the region. If demand can be found, thus raising the price of kava, this would lead to money flowing to rural smallholder farmers across the Pacific. There are no other cash crops with the same potential for the Pacific: kava is referred to as 'green gold' and the 'Pacific's economic diamond.'

It is clear therefore that growing demand for kava, particularly export demand, is crucial to achieving sustainable development within the Pacific. At the same time, there is an increasing environmental risk from overplanting, particularly when it results in deforestation – something that must be managed.

This report aims to understand what role digitisation can play in unlocking this potential. It relies on a literature review and consultations with key stakeholders. It begins with an economic analysis of the industry, before using this knowledge to assess the feasibility of digitising kava to support sustainable development across the Pacific.

The clear consensus from these consultations is that the major barrier to the growth of the international kava market is quality across the entire value chain. Ongoing data on the industry is currently limited mostly to export data, complemented by infrequent agricultural censuses or one-off studies. Even though Commonwealth member countries have some systems in place for managing kava data, these are not adequate. Above all, there is no single data aggregation system for kava across the region to provide a collective value for the commodity for policy decision-making as well as financial decision-making by external market players and investors. Concerns around data quality, combined with logistical challenges, mean that there is limited scope for increasing data collection. Other areas where there is a major need for improvement is in the formalisation of markets, the use of mobile money, the use of e-commerce and access to financial services.

For the digitalisation of agriculture to work, the first step is digitisation. Digitising Kava is about making kava data digital (instead of analogue) and taking a national approach by co-ordinating and building agricultural data infrastructure or digital public infrastructure for kava in each country, and eventually connecting these systems regionally. The potential benefits of digitisation within the Pacific are extremely high, as digital technologies can overcome the geographic barriers that are inherent in the remote and dispersed economies of the region. For a national and regional commodity like kava, national data infrastructure should be at the centre of digitising the commodity. Improving agricultural data infrastructure in general, and kava data infrastructure specifically, will be an important foundation for implementing the region's strategies and policies for the development of the kava industry. National and regional kava data infrastructure will enable data aggregation points at country and regional levels for trade and investment.

At the same time, the barriers to digitisation in the region are also extremely high. They include small market size, limited capability, weak digital infrastructure and poor access to finance. These barriers combine to mean that it is unlikely that any private sector body alone will be able to digitise the wider kava industry successfully and

sustainably. Digitisation by private sector entities is therefore expected to be limited mostly to their internal processes.

Hence, a national or regional approach to kava data management requires a leadership effort

by the public sector. One of the most obvious outcomes of digitisation will be in the dissemination of information from the centre (government, non-governmental organisations, etc.) out to farmers, to try and drive an improvement in standards.

1. Purpose and methodology

The purpose of this study is to understand the feasibility of digitising the kava value chain in order to support the sustainable and equitable expansion of the supply chain for the benefit of the Pacific people and nations.

Kava is one of the most important economic crops in the Pacific, while digitisation – aided by ever-improving technology – offers new opportunities in driving development in the region, even while facing substantial barriers. This report therefore seeks to understand which of these benefits may be achievable, and what steps need to be taken to realise these benefits. It seeks to support policy development across the region.

The starting point for this report was two concurrent literature reviews – one looking at the kava industry in the Pacific and one at the digitisation of kava (agricultural) value chains. These literature reviews were combined with the authors' own knowledge of the kava industry, to provide the basis for semi-structured interviews with key stakeholders across the region.

Section 2 of the report presents an examination of the kava industry, on the understanding that, to be able to assess the feasibility of any digitisation, there must first be a thorough understanding of

the value chain itself, noting the different role that kava plays across the Pacific Island nations. Section 3 then looks at the digitisation of agriculture in general, including the benefits and barriers. Sections 4 and 5 then combine the two to look at opportunities for digitisation within the kava value chain specifically and implications for the digitalisation of agriculture in the region. Section 6 concludes.

This study reached the statistics authorities and agriculture departments of each of the major countries of the region, as well as other relevant government agencies, private sector actors and regional bodies. The major issue faced when undertaking the study lay in access to stakeholders, with several key stakeholders not responding to requests for interviews. In addition, the data and literature on kava are relatively limited.

This report is written within the broader aim of supporting the sustainable development of the Pacific region and following the vision of the 2050 Strategy for the Blue Pacific Continent, as endorsed by the Pacific Islands Forum Leaders: '*a resilient Pacific Region of peace, harmony, security, social inclusion and prosperity, that ensures all Pacific peoples can lead free, healthy and productive lives.*'

2. The kava industry

This section includes an introduction to the kava plant – including the health impacts, a basic market analysis and an examination of future opportunities and risks – and concludes with country profiles.

2.1 The kava plant

Kava, (*piper methysticum*) is a member of the pepper family that is grown across the Pacific.¹ Its exact origin is unknown, although it is speculated that this was in the northern islands of Vanuatu, in part because of the extremely high concentration of varieties found in that region. It is now grown across the Pacific region, and it is thought to have been used for 2,000 to 3,000 years in social gatherings (Bula Kava House, 2014).

The word 'kava' is used primarily to refer to the kava plant and the drink prepared from the fresh or dried roots and stems of the plant. When kava is prepared in this traditional manner, it produces an intoxicating non-alcoholic water-based beverage. This product is the focus of this report. Kava is also occasionally used to refer to other uses of the plant, particularly in medicinal or pharmaceutical products, although these are predominantly kava extracts, and clear communication about the product remains important.

The active ingredient of kava is kavalactones. There are 18 different types of kavalactone in total, but 6 different kavalactones provide over 95 per cent of the kavalactones of the plants (Tasi, 2021). There are over 100 different varieties of kava, with the precise number changing frequently (Kavafied, 2020). There are two main types of kava: noble kava, which produces a heady and relaxing feeling, and tudei (two-day) kava, which feels heavier and more sedating, and is more likely to make the user feel nauseous. Tudei kava contains higher levels of flavokavains, and this means that a simple acetone test is possible to reliably test whether a kava product is noble or not. Some private sector actors are investing in more detailed laboratory tests to ascertain the exact variety of kava based on the specific genetics, although this information is not likely to be publicly available.

2.2 Growing the kava plant

The noble varieties of the kava plant are sterile, with only male plants known (Food Standards Australia New Zealand, 2004). Farmers are therefore required to propagate the plant naturally. Kava plants grow better initially in shady spots, and generally grow best in climates with high rainfall, year-round high temperatures and humidity. The plant requires fertile but loose soil, which has good drainage. Kava does not grow well in heavy clay soils (Secretariat of the Pacific Community, 2021).

The kava crop is relatively heavy on the soil and can damage long-term soil fertility, particularly if monocropped (Secretariat of the Pacific Community, 2021). Crop rotation and intercropping are the two main techniques used to counteract this. Another benefit of intercropping is that it can provide the kava plants with a suitable mixture of sunshine and shade. This in turn means the plant is best suited to being grown in relatively small-scale operations, with limited large-scale investment opportunities at the primary stage. Further barriers to large-scale investment include land ownership constraints, and the topography and geography of the region, which make it very difficult to have large farms. At the same time, this is not the sort of investment that Pacific Island countries generally want to encourage, as mass production would have impacts on a high number of smallholder kava farmers, who currently enjoy relatively high prices.

Kava is a perennial plant that is harvested in its entirety after an approximate minimum of three years. Additional time allows the plant to mature and grow more and further improves the quality. For example, in Vanuatu, the Kava Act allows for harvesting the plant after three years for the domestic market but stipulates a minimum of five years for the export market. There exists no way of testing the age of a kava plant, however, thus enforcement is challenging. One kava plant can generally be expected to provide approximately 5–10 kg of produce, although this will vary with age and variety.

Because there is no specific harvest time, and because the plant continues to improve, farmers are often able to harvest in a period that is most suitable for them – either when the price is high or when they have need of money. This in essence

¹ Major producing nations are Fiji, Tonga and Vanuatu, with Federated States of Micronesia, Papua New Guinea, Samoa and the Solomon Islands also producing kava.

allows farmers in certain circumstances to use kava in the ground as a way of storing wealth. This is of particular value in a region where access to financial markets and products is often limited. It also allows supply to adjust to demand. For example, during the COVID-19 pandemic, many farmers reduced their harvest as prices fell.

The only widespread disease currently affecting kava is kava dieback disease. Scientific experiments have shown that cucumber mosaic cucumovirus (CMV) is either the direct cause of kava dieback or a significant component of a disease complex. CMV is common to many other agricultural crops (e.g., tomatoes). It is spread by insects (aphids) from plant to plant, and there is no treatment. The only way to keep it at bay or to limit its impact is to use good agricultural practices: for example to reduce the density of kava plants, to avoid planting other crops in the vicinity that are also vulnerable to the disease or to use crop rotation.

Once the kava is harvested, it is then either drunk while fresh or dried.² Fresh kava should be drunk within a maximum of two weeks: a longer wait leads to oxidation, shrinkage, and a worse taste. Traditionally, kava was dried by sunlight or by smoke, methods that struggled to provide a guaranteed consistency. This was one of the factors in some farmers continuing to provide sub-standard products to the exporter – for example with the presence of mould – which represents either lost income for the farmer or increased costs for the business. Transport and storage remain barriers to improvement of the quality of the product. In recent years, some farmers have begun to use solar driers, which can provide greater consistency (Turagaiviu, 2020; PHAMA Plus, undated).

2.3 Health impacts

The most comprehensive review of the health impacts of kava is a 2016 report by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO), *Kava: A Review of the Safety of Traditional and Recreational Beverage Consumption*.

This report notes that '*There are very few published reports of adverse health effects arising from the traditional consumption of kava beverage*', although it also states that it cannot conclude whether this

is down to 'a genuine low incidence level of adverse effects or a lack of reporting and systematic data collection'.

In 2002, a number of countries, led by Germany and the EU, banned kava, partly because of a fear that it was hepatotoxic (damaging to the liver).³ There were a few cases of liver damage but subsequent research suggested that kava was not the cause of the hepatotoxicity.⁴ This led to the ban on kava being overturned in at least some of these countries,⁵ but there remains widespread reputational damage.

In vivo animal studies do not provide evidence of kava-induced hepatotoxicity, while clinical surveillance of aboriginal people in northern Australia have not documented any cases of hepatic failure attributable to kava, or of long-term liver damage.

Hepatotoxicity can occur from either poor handling or preparation of the kava (e.g., mouldy kava can be toxic), or if the wrong parts of the plants are used (e.g., the leaves and stems contain pipermethystine, a potentially toxic alkaloid). This is particularly true for the parts of the plant that are heavily exposed to the sun. These parts of the plant also have the lower levels of kavalactone.

It is therefore important only to use the parts of the stem that are close to the ground for drinking kava. A general rule of thumb is only to use up to the first node. This further emphasises the need for proper handling and preparation of the plant.

The WHO/FAO report notes that heavy consumption of kava beverage can lead to a number of adverse impacts, including scaly skin rashes, weight loss, nausea, loss of appetite and indigestion. Other possible effects may include sore red eyes, laziness, loss of sex drive and general poor health. These effects appear to be reversible if the kava use stops. There is no evidence of any impact on cognition.

3 In Germany, consumption was of kava extract rather than kava mixed with water. The decision to ban kava mentioned a lack of proven efficacy of these kava extract products. While these products are an interesting potential future avenue, this report focuses on kava mixed with water, as defined by Codex Alimentarius.

4 The kava in the product was often extracted using ethanol or acetone. Subsequent research suggested that it was either this or other products that were leading to the liver damage, not the traditional kava product.

5 The UK is a notable exception in still banning kava.

2 Fresh kava drinking is common only in Vanuatu.

Further evidence is provided from the communities that have been drinking kava for thousands of years with minimal evidence of adverse health impacts. However, most of this consumption has been at moderate levels, while heavy use of kava has been increasing across many Pacific Islands recently.

The WHO/FAO report further notes that the limited information available indicates that adverse effects begin to appear at an average consumption of 240–440g of kava powder/week, although further research is needed.

The report identifies a number of data gaps, in the areas of kava varieties and beverage composition, kava components and their properties, human health impacts and consumption. Annex 1 presents a full list of these data gaps.

The report also notes that it should be possible to establish parameters to '*ensure a reasonable certainty of no harm from consumption of [the] kava beverage*'. It also states that the two key steps involves improving controls across the value chain to drive quality and establishing permissible daily intake levels for kava beverage components. This will also help drive consumer confidence and investment.

A further risk lies in mixing kava with other drugs or products. This is because the enzymes the liver uses to break down other drugs are the same as those it uses for kava – for example alcohol. Therefore, drinking alcohol with kava may mean that the liver is busy breaking down the kava and so does not break down the alcohol as efficiently, thereby possibly damaging the liver (ADF, 2022). The research indicates that drinking alcohol after kava should be avoided, and further research is needed to understand the impacts of combining kava and other products. Clear communication and good labelling of kava products is important to ensure responsible use.

There remains limited evidence regarding the use of kava during pregnancy or breastfeeding, and so it is generally advised to avoid drinking kava under these circumstances out of caution.

2.4 Potential health benefits

A number of potential health benefits are linked with kava, including (van de Malle, 2018):

- reducing stress and/or anxiety;
- aiding sleep;

- protecting neurons from damage and reducing pain;
- potentially reducing the risk of cancer, although this evidence is restricted to mice and further research is needed.

The majority of the research has focused on stress reduction, and there does seem to be strong evidence that kava can have a beneficial impact here. There is a limited but growing global pharmaceutical market, which offers high potential for investment.

2.5 Kava standards

In 2020, the Codex Alimentarius Commission approved a standard for kava products when mixed with water. Key aspects of the standard are that it identifies kava as a food product and makes it clear that only noble kava should be consumed under the standard and that Good Agricultural Practices and General Principles of Food Hygiene (CXC 1-1969) and the Code of Hygienic Practice for Low-Moisture Foods (CXC 75-2015) should be followed at all times. This standard was generally seen as sufficient in the consultations.

The Pacific Classification of Individual Consumption According to Purpose 2020 (PACCOICOP) is the primary tool for Pacific Island Countries and Territories (PICTs) to collect and present regionally and internationally comparable statistics. This provides sufficient guidance for PICTs to ensure consistency in how they present data. The PACCOICOP defines kava as a narcotic when looking at the consumption. The Pacific Harmonized Commodity Description and Coding System 2017, which is used for imports and exports, defines kava as a vegetable product. These standards were generally in use before the Codex standard was passed. Consistency between how kava was treated between all standards would be beneficial.

2.6 Market analysis of kava

2.6.1 Supply

Limited accurate data exist regarding the volume of production of kava, although a number of high-level statements can be made with a large degree of confidence. Kava is almost exclusively grown in the Pacific, with Vanuatu and Fiji the two largest producing nations. PHAMA Plus estimates the total production capacity to be in the range of 32,000–35,000 tonnes fresh weight in Vanuatu and about 13,000 tonnes of dried kava in Fiji (Ligaiula, 2021).

Tonga is the next largest kava producer. Samoa and the Solomon Islands also have notable production. There are small volumes of kava production elsewhere, for example in the Federated States of Micronesia, where there were 3,362 households growing kava in 2016 (24 per cent of all households with land available for agriculture) (Statistics Division, 2016).

The vast majority of growers are small-scale subsistence farmers. For example, the Vanuatu Primary Producers Authority has surveyed 4,272 'serious farmers,' who estimated that they had 1,500 kava plants on average. Many such farmers will spend a relatively small amount of time each week (often fewer than 10 hours) tending their gardens, as the fertile land and high returns to kava enable a small amount of input hours. The benefits of this system are that kava is a relatively equitable crop, with smallholders able to command a high return. The major downside is that quality is extremely difficult to control and improve.

Recently, the price of kava has been increasing, leading to increased investment at the production stage, in terms of both number of farms and size of the largest farms, with numerous reports of farms with up to 100,000 kava plants. The larger farms will often employ labourers or farm workers in an informal manner, generally at relatively low (often below minimum) wages. While these farms face barriers to their success, as outlined above, if they are successful there is a chance they will be able to provide kava at a consistency, quality and price that smallholders will not be able to compete with. This could in theory lead to a scenario of the overall market kava growing but in an inequitable fashion, thereby potentially causing social and economic problems as smallholders lose out.

There was universal agreement that the volume of kava being planted was increasing sharply across all the major producing countries, although no data are readily available on this. Given that kava takes a minimum of three years to be ready for harvest, it is likely that the supply of kava will continue to increase steadily, with the possibility of a sharp increase in the total supply, leading to potential oversupply.

The quality of the supply remains a major barrier to the growth of the industry. This refers to both the variety of kava and how it is grown, harvested and transported. With regard to the variety of kava, this is particularly an issue for Vanuatu, given the large number of varieties that exist there compared with

other nations: over 80 known varieties are grown in Vanuatu, with Fiji and Hawaii (both 13) having the next highest number (Kalm with Kava, 2018). This means that tudei kava is far more common in Vanuatu, although economic incentives and training have incentivised increased planting of noble kava in recent years.

More of a concern with regard to the supply of kava is ensuring it is free of any microbial contamination. Many farmers do not follow best practices when handling their kava, even though kava should be treated as a food throughout the value chain, as per the Codex guidelines. There are similar concerns about transport and shipping. There is highly limited traceability, and, anecdotally, biosecurity export checks are often limited. This means that many importers in the US will do additional cleaning and testing, to make sure the kava is safe for final consumers. Other importers will only import kava roots and chips and do the processing themselves, to ensure the safety of their product. This reduces the wealth from the product that is maintained in the Pacific Islands.

While many kava farmers use purely organic farming techniques,⁶ there is essentially no certification of this. This reflects the scale of the operations and the fact that there is currently no strong incentive for farmers to invest in this certification.

Within each of the countries there are a number of processors, varying from small and local operations (particularly prevalent in Fiji and Tonga) to large operations with equipment costing millions of dollars (found only in Fiji and Vanuatu). An increasing number of operators are Hazard Analysis and Critical Control Point (HACCP) approved (or have an equivalent qualification), with increasing levels of final product sophistication.⁷ There are also more operators selling directly from the Pacific to consumers internationally through e-commerce platforms, although high transport costs make shipping from the Pacific directly to the consumer difficult. This therefore remains a niche market (Judge, 2022).

6 Particularly in Vanuatu, where the use of pesticides and herbicides is near non-existent. This is in contrast with Fiji, where, anecdotally, the use of these products is far more common.

7 As an example, one operator is now selling a range of instant kava powders of single cultivar plants, allowing consumers to directly choose the type of kava experience they want with an HACCP-approved instant powder.

Kava is currently not grown at any scale outside of the Pacific, and it is this that underpins many of the possibilities for development that it offers. If this were to change, this would have the potential to undermine much of the advantage the Pacific has in international markets, as the Pacific traditionally struggles to compete on quantity, consistency and price. Protecting the cultural and economic heritage of the Pacific should be a key consideration for regional co-ordination.

2.6.2 Demand

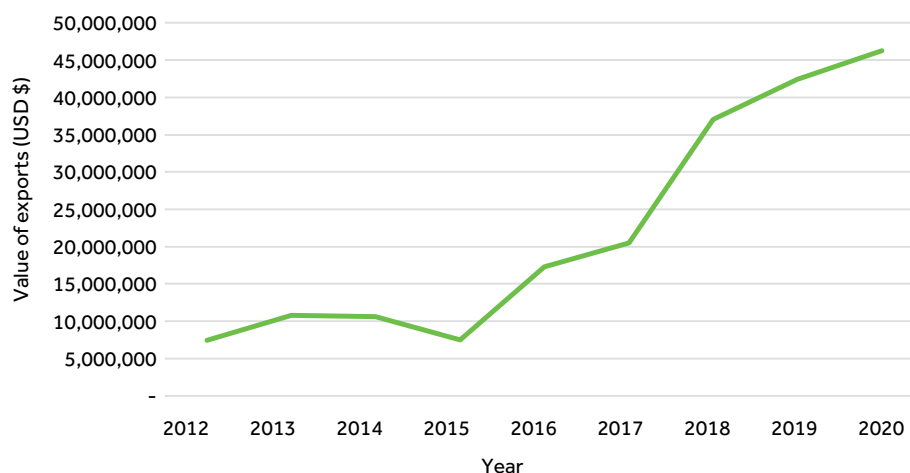
The majority of demand is domestic within the Pacific, with Fiji, Tonga and Vanuatu all having domestic markets larger than their export markets. This market has grown rapidly over the past 30 years; prior to this, kava was dominated by its traditional uses. Limited data exist on the size of the domestic markets, however. In 2018, PHAMA Plus estimated that domestic consumption in Fiji was approximately 3,500 tonnes of dried kava a year, compared with 250 tonnes for export, whereas in Vanuatu an estimated 70 per cent of the kava goes to the domestic market (Department of Agriculture and Rural Development, 2016). Much of this demand is subsistence, with many farmers or communities growing and drinking their own kava.

In many of these countries, there are still strong gendered differences in kava consumption, with men much heavier consumers than women. For

example, in Vanuatu, in the 2020 Census, nearly five times as many men as women reported drinking kava in the previous week (49,249 vs 10,098). This is often dictated by cultural norms and expectations about gender. Improving the access of women to drinking kava within the Pacific is therefore one of the simplest pathways to increasing demand. Export demand has been growing rapidly, as Figure 2.1 shows, with the value of kava exports from Fiji, Tonga and Vanuatu increasing by nearly 500 per cent between 2012 and 2021.⁸ This owes partly to higher prices and partly to increased volumes. Other major Pacific Island markets include Kiribati, New Caledonia and New Zealand. For example, in 2018, 23 per cent of Vanuatu's kava went to Kiribati and 16 per cent to New Caledonia, while New Zealand is Tonga's largest market. The New Caledonian market has declined over the past decade, with more rigorous regulations and higher taxes on kava operators within New Caledonia helping drive this fall.

Another large source of demand is the USA, where it is thought that there are around 300 kava bars, although there is no single source of data for this: US authorities do not report on how much kava they import. While kava remains a highly niche product, it is growing rapidly, with new kava bars opening on a regular basis, and the crop is gaining increasing recognition. Exports of kava from Fiji to the US grew from FJD 2.6 million in 2013 to FJD 29.6 million in

Figure 2.1 Value of kava exports for Fiji, Tonga, and Vanuatu combined (US\$)



Note: Own calculations to US\$ using exchange rates from xe.com on 7 August 2022.

Source: SPC Kava Data Hub (<https://pacificdata.org/data/dataset/kava-df-kava>).

⁸ Part of this may be double-counted, as Fiji imports then re-exports kava, particularly from Vanuatu. These three countries were selected as they are the largest kava exporters and have the most reliable export data.

2020, an annual growth rate of 42 per cent. Within the USA, only kava as a beverage is approved for the market.

The Australian market has also historically been important, through the 'suitcase trade', with Pacific islanders frequently bringing their personal allowance of kava into Australia, either for personal use or to sell on.⁹ No data have been collected by any party on the size of this trade, although anecdotally the major sources of this kava are Fiji and Tonga. The Australian government has recently begun a trial allowing the import and sale of kava on a commercial basis, beginning on 1 December 2021. By 7 April 2022, approximately 46 tonnes had been exported to Australia, by 193 different exporters, with Fiji, Tonga and Vanuatu the major suppliers (PHAMA Plus, 2022). Given the size of the Australian market, its locality to the islands and existing trade routes, and the size of the Pacific diaspora, this represents an excellent opportunity for growth within the industry.

Most of the kava exported from the Pacific Islands is powdered (ground/pounded). For example, in Tonga (the only country that releases data on the type of kava exported), 99.6 per cent of kava exported in 2021 was ground kava. The main exception to this is Vanuatu, which still exports a significant amount of dried kava in roots/chips form, with 56 per cent of kava exported in 2018 being of this form (Government of Vanuatu, 2020).

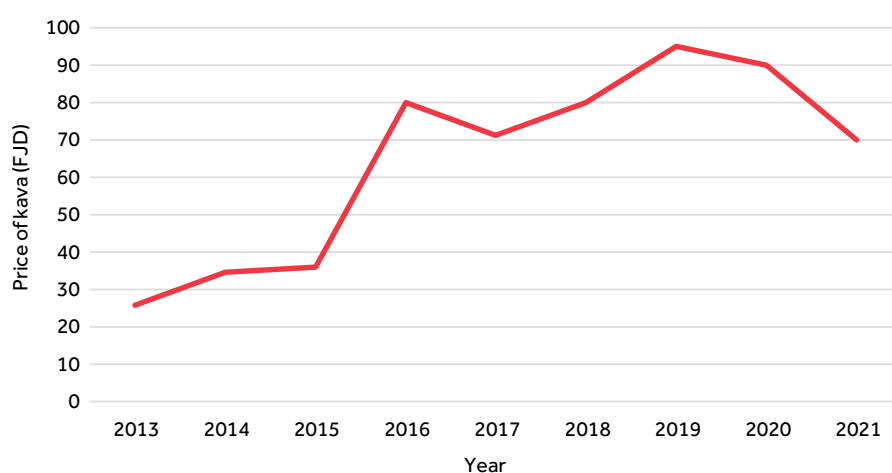
The majority of this kava is exported as a food, and is drunk in a water-based beverage, under the guidelines established by Codex. There is also a growing pharmaceutical market, although these companies currently buy kava in powder or root form, and there is no processing available in the Pacific Island nations to make pharmaceutical products. While this offers a theoretical opportunity for investment, given the relatively small size of the market, the difficulties associated with doing business in the Pacific Island nations and the need to guarantee quality, there are substantial barriers for a pharmaceutical company in establishing a facility to produce kava-related products within the Pacific.

There is also a small market for other value-added kava products, such as kava gummies or chocolate. Given that many consumers – particularly non-Pacific islanders - like the effect of kava but not the taste, improving these products offers a clear avenue to grow and expand the market. This is one of the most obvious possibilities for value addition and investment within the kava value chain.

2.6.3 Pricing and returns for farmers

The best source of information regarding pricing is the Fijian farm-gate price (SPC Kava Datahub). According to data collated by The Pacific Community (SPC) and shown in Figure 2.2, the

Figure 2.2 Price of kava in Fiji (FJD/kg)



Source: SPC Kava Data Hub (<https://pacificdata.org/data/dataset/kava-df-kava>).

⁹ Selling kava within Australia would have been illegal at this point in time.

farm-gate price increased by 269 per cent between 2013 and 2019 (FJD 26–95/kg) before falling to FJD 7 in 2021 as the impacts of COVID-19 were felt.

A further proxy price can be calculated using export figures for value and quantity, to work out the average price of a kilogram of kava export products over time, as shown in figure 2.3. This is an imperfect measure as it does not allow for any change in the composition of exports. For example, Vanuatu shifted from exporting roots and chips to exporting higher-value powder over this period, which would partly explain the price increase.

Regardless, there has been a steep increase in the price of kava exports, with the average income from a kilo of kava exports doubling in Fiji between 2013 and 2020 and more than trebling in Vanuatu over the same period.

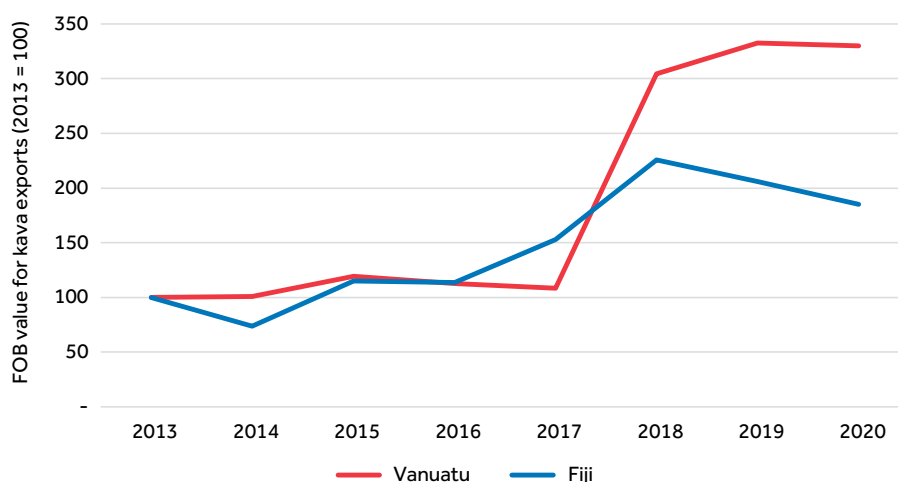
Domestic prices have also increased, more than doubling in both Fiji and Vanuatu in the years leading up to the pandemic (Talanoa Consulting, 2020; Judge, 2022).

For farmers, these higher prices mean that the return on kava is extremely high. For example, within Vanuatu, an unpublished comparative advantage analysis showed that at 2019 prices 'no other crop or livestock enterprise can come anywhere near kava in terms of profitability' and that 'its economic

importance in remote outer island locations cannot be over-estimated as it generates far more cash income for rural household and communities than any other economic activity'. This analysis suggests that, at 2018 prices, a farmer could expect to make an average annual gross margin of VUV 7.4 million per hectare per year, equivalent to US\$ 63,000. While this analysis was based on the high prices at the time,¹⁰ and assumes a high yield,¹¹ there are very few crops globally that will provide smallholders with a return anywhere close to this. This analysis was slightly higher than estimated in the Vanuatu Kava Value Chain Analysis, which suggested annual returns of VUV 5.2–6.2 million per hectare. This high return has long been the case when prices are high. For example, in 1999 analysis suggested that intensive kava production generated 'huge rates of return to labour and land that cannot remotely be managed by any other crop' (McGregor, 1999).

Similarly, in Fiji, kava has been described as 'the most valuable crop grown ... [with] high returns to labour and acts as a mechanism for wealth redistribution from urban centres to rural communities' (Talanoa Consulting, 2020). In Fiji, the gross margin per hectare per year is FJD 37,000 (PHAMA Plus, 2018a) (US\$ 16,800) – substantially lower than the estimate for Vanuatu but still highly profitable. This analysis assumed a price of FJD 40/kg, while the most recent price sheet from the

Figure 2.3 FOB value for Fiji and Vanuatu, 2013–2020 (2013=100) (US\$/kg)



Note: Own calculations to US\$ using exchange rates from xe.com on 7 August 2022.

Source: Own calculations, using quantity and value export data from SPC Kava Data Hub (<https://pacificdata.org/data/dataset/kava-df-kava>).

10 VUV 800 per kg.

11 The analysis assumes 8,000 plants planted in a hectare, slightly higher than PHAMA Plus's assumption of 6,000 per hectare.

government has the price at FJD 75–108/kg (Fiji AgTrade, 2020), with a reported peak of FJD 140/kg (Talanoa Consulting, 2020).

Prices have since fallen, with reduced demand resulting from the pandemic a key driver, along with increasing supply. In Fiji, prices have reportedly fallen to FJD 70, while those in the main kava market in Vanuatu have fallen from VUV 800–1,000/kg to VUV 500–700/kg (Judge, 2021). There are no clear pricing data for other countries.

The export data from Fiji suggest there are large variations in price between different markets, with 1 kg of product going to the USA receiving on average FJD 99 in 2020, compared with FJD 53 for the New Zealand market.

2.7 Analysis of the future opportunities and risks in the kava market

2.7.1 Opportunities

The level of penetration of kava into global markets remains limited, with the US being the only major market outside of the Pacific. Given the strengths of kava – a natural non-addictive product that produces a low-level high with limited health impacts when consumed correctly, with a romantic backstory – there is certainly a high degree of potential for growth in global demand, either in existing markets (particularly Australia and the US) or in new markets. The near unanimous consensus from the consultations was that improving quality was by far the main obstacle to achieving this growth.

As outlined previously, the returns for kava to smallholder farmers are very high, with farmers making particularly large profits towards the end of the past decade. If the potential global demand for kava can be successfully tapped into, thereby driving export revenue and allowing high prices to become the norm rather than an exception, then kava has more potential to drive development in the Pacific Islands than any other crop.

As well as this potential for growth and high returns, kava is a relatively equitable crop, with high returns for farmers. For example, in Fiji, the return to brokers is estimated to be just 10 per cent of the price paid to the farmer (PHAMA Plus, 2018a). The industry is characterised by a large number of smallholder farmers who are able to command a relatively high price, and the difficulties in mechanising or mass producing kava will mean the market is likely to stay this way. Table 2.1 summarises the estimated returns for different actors across the value chain, highlighting the large value captured by the farmers.

High prices in the future would allow individual farmers to continue to produce relatively small quantities and make a good living. This would have the advantages of supporting the traditional pace of life within the Pacific, while also ensuring that sustainable farming practices can be prioritised and maintained.

As the global market continues to mature and grow there should be increasing viability for new kava products. As customers become more knowledgeable and discerning, the price premium from high-quality kava could increase, allowing greater economic opportunities for businesses that can provide this quality on a consistent basis – for example of particular single-strain cultivars. This has been a growing trend in recent years and is likely to be a continuing source of growth.

Given that drinking kava is not an activity enjoyed by all, there is also a clear opportunity for improving and expanding value-added products for kava – for example kava gummies or kava chocolate. Regulation of these products is limited and often unclear, with many jurisdictions explicitly allowing kava only when drunk as a beverage. The initial market is therefore likely to be limited for these products, but over the medium term, if a sufficient quality of product can be reached and markets can be expanded, this would offer a clear diversification of the market.

Table 2.1 Estimated returns for 4,500 hectares (FJD million)

	Farmers	Traders	Vendors	Exporters
Gross income	182	205	295	25
Variable costs	15	186	240	23
Gross margin	167	19	55	2

Source: Judge (2021).

2.7.2 Risks

Despite these strengths and opportunities, there remain a number of risks for the kava industry. The region as a whole is one of the most exposed to natural disasters in the world, with cyclones in particular having the potential to cause widespread damage or destruction to a large proportion of the global kava supply. For example, Cyclone Pam in 2015 was estimated to have caused VUV 2.3 billion (US\$ 20 million) of damage to the kava industry in Vanuatu, and Cyclone Winston caused FJD 115 million (US\$ 53 million) to the industry in Fiji in 2016 (Yoshida, 2016). The combination of these two cyclones together led to a sharp fall in global supply, which was a key driver behind the rising prices.

Kava is also heavy on the soil, and, although historically most farmers have known how to manage their soil and so follow sustainable farming practices, as the industry grows there is an increasing risk that new farmers will not know these techniques.

The increasing level of supply is also leading to concerns about deforestation, raised in both Fiji and Vanuatu especially, about the impact of increased levels of planting – although, once, again there and no clear data on the size of this issue (Markham, 2022). This was not something that consumers in any of the consultations reported being aware of but, as well as the environmental degradation, it does theoretically pose a risk to the attractiveness of kava as a product. In future, greater traceability could therefore be required to ensure the kava people are drinking is being sourced in a sustainable manner, if this is something that consumers or authorities' demand.

It is particularly important to consider good custodianship of the environment in the context of the climate crisis, which will continue to have an increasingly devastating impact on the Pacific. The Boe Declaration states that the climate crisis is the 'single greatest threat to the livelihoods, security and wellbeing of the peoples of the Pacific.'¹² In the worst case reasonable scenario, the climate crisis will lead to a regression in terms of the Pacific's development, which would indirectly damage the kava industry through a number of mechanisms – for example reducing domestic demand because of lower income levels.

More specifically for the kava industry, while there is a high degree of uncertainty as to the magnitude of the negative impacts of the climate crisis, a number of mechanisms will negatively affect kava, including increased severity of tropical cyclones, increased risk of droughts and increased risk of extremely heavy rainfall. Because of this, the climate crisis may also incentivise the use of more resilient varieties, which generally are of lower quality.

Finally, while kava does offer immense economic opportunities for farmers, care must be taken to ensure any development occurs in a sustainable manner that does not cause unintended damage in other ways – for example by disrupting the more traditional economies that many Pacific Island nations have used for centuries to ensure they have sufficient access to food. This has been raised as a concern in both Tonga and Vanuatu. A specific example is Pentecost Island in Vanuatu, which was highly dependent commercially on kava, with 95 per cent of households reporting growing kava in the 2020 Census. Recently there have been widespread reports of food vulnerability, particularly since Cyclone Harold, a category 5 storm that caused widespread damage across the south and centre of the island. Pacific Islands must also ensure their economies do not become overly reliant on kava, and suitable incentives exist for farmers to sufficiently diversify their income and the economy.

2.8 Data collection in the kava industry

The heritage of a verbal transmission of cultural traditions and history that characterises most populations in the Pacific region is reflected in the little amount of written data available for digitisation and the limited accuracy of verbal reporting. Quality and formatting of data are equally critical to achieve sustainable digitisation. The quality of data increases the model's predictability. The quality of data in the Pacific are often limited, particularly those from farmers, who themselves will often not be collecting the data desired – number of plants, age, variety, sales history, costs, etc. One example is the Vanuatu Primary Producers Authority, which asked farmers how many kava plants they had. The answers were often best guesses from the farmers, with the nature of the conversation indicating that the results should be used as an indicative ballpark figure at best, rather than as completely accurate data. For example, round numbers were often given, such as exactly 3,000 kava plants.

¹² <https://www.forumsec.org/2018/09/05/boe-declaration-on-regional-security/>

Limitations with the data should be acknowledged and sets of rules defined upstream to ensure the variables measured are gathered in a consistent manner. The results of data analysis through digitisation are powerful, and the impact of the digitisation, which aims to be positive, could be exponentially adverse if the data fed into the model are biased or inconsistent, or if farmer and users lack the filters to interpret the outcome. The experience of Esoko in Ghana, carried out by the Agricultural Research Centre for International Development (Centre de coopération internationale en recherche agronomique pour le développement, CIRAD) outlines the challenges inherent to data treatment, with an emphasis on data bias impact on the quality of interpretation and outcomes (van Schalkwyk and Young, 2017).¹³ The formatting of the data collected will influence usability and the costs involved in the data treatment for efficient digitalisation.

2.9 Current data collection

This section briefly summarises current data collection in the kava industry. More detail is provided in the individual country profiles. By and large, the available data are clear and easy to access, with the statistical information readily available online.

SPC has recently launched a Kava Data Hub (<https://pacificdata.org/data/dataset/kava-df-kava>), which compiles most of the existing data into one place. Assuming this continues to be maintained, then there is a clear and easily accessible source of data.

13 The Esoko project, formerly known as TradeNet, began in 2005 with funding from the USA to a private company to collect data on crop prices in 30 markets and supply pricing information to subscribers via text messages. The programme extended to other mobile-based services and content. Esoko has worked since 2007 with SEND West Africa, a local non-governmental organisation (NGO) that facilitated the acquisition of mobile phones for 500+ farmers in the Northern region and set them up for automatic text alerts on prices. The CIRAD economists then studied the causal effect of an Esoko-based programme on marketing performances of beneficiaries of the NGO-funded programme during the 2009 and 2010 seasons. The impact on users was defined as the difference between the level of outcome observed among users and the level that would have been observed without access to pricing information data. The main feedback underlined the challenges to getting rid of selection bias and confounding effects, and it was concluded that it was almost impossible to exclude the remaining bias induced by the data collection methods. Consequently, better work could be done to improve the data identification strategy and design appropriate tools for large-scale data sampling.

Each country has a national statistics office/ bureau of statistics that is governed by legislation of varying quality. For example, the Solomon Islands is still relying on legislation from 1970 (with subsequent amendments), whereas Vanuatu passed a new bill in 2022 to update the mandate of the National Statistic Office, designed to help ensure the institution is relevant for the modern age. All these institutions recognise that it is part of their mandate to govern or guide the use of statistics in their country, for example by developing data standards. Many of them have to produce a wide range of statistics, yet are relatively small, with fewer than 50 staff members¹⁴ and limited skills. The exception is Fiji, whose office is substantially larger than the other institutions and has higher education levels, meaning a higher level of skills.¹⁵

This means that the institutions have to prioritise which datasets to produce, with the results generally being a limited number of core high-level statistics on a regular and frequent basis – for example gross domestic product (GDP), trade, population, etc., on a monthly/quarterly/annual basis – and then a number of key publications on a longer-term timeframe – for example population and housing or agriculture censuses, which generally happen every decade. This also influences the type of data available, with most information being published retrospectively, although there have recently been a few projects that aim to collect or publish data on a 'live' basis.¹⁶

The countries under examination all are at different stages of developing a strategy or policy. The Solomon Islands has a National Statistics Development Strategy 2016–2035, Tonga has a Strategy for the Development of Statistics 2019–2023 and Fiji is in the process of developing a Strategy for the Development of Statistics (Naiqama, 2021). Vanuatu's National Strategy for the Development of Statistics expired in 2020,

14 For example, the Vanuatu National Statistics Office has approximately 40–50 staff (<https://vnso.gov.vu/index.php/en/about/our-team>), whereas the Solomon Islands Statistics Office has 26 (www.statistics.gov.sb/).

15 The Economic Division alone in Fiji Statistics has 47 staff (www.statsfiji.gov.fj/about-fbos/our-organisation-structure/economic-statistics.html). The full structure was not available.

16 For example, the TAILS project in Vanuatu collects data from fishers on a variety of metrics (<https://fisheries.gov.vu/index.php/what-we-do/projects/tails-projects-sites.html>). There is no publicly evaluation or update on the progress of this project, which has been ongoing for two years.

although the country does have a 10-Year Data Collection Plan. These policies all focus on the internal processes of the organisation and provide some guidance to other users of data. Looking at this from a holistic perspective, ensuring that countries have robust national strategies and continuing to implement these strategies and building capacity are the clearest opportunities for further developing data infrastructure, rather than going through the kava value chain.

According to United Nations Conference on Trade and Development (UNCTAD),¹⁷ none of the major kava-producing nations have data privacy legislation, although Vanuatu has announced it is in the process of developing appropriate legislation to be passed in 2022 or 2023 (Council of Europe, nd). Vanuatu has also passed a cybercrime bill, as have Fiji, Samoa and Tonga (UNCTAD). Fiji, Samoa and Vanuatu have regulations that recognise the equivalence between paper-based and electronic transactions.

Many of the institutions are now increasingly using technology to help in their day-to-day work. For example, Vanuatu will use tablets in its upcoming Agricultural Census. The institutions are – to varying degrees – using increasingly complex algorithms or coding techniques to analyse their data. Vanuatu has recently reduced the time to produce a trade report from six weeks to less than one (Carolan et al., 2021).

With regard to the kava industry, as outlined previously, there are numerous classifications used for the compilation of data. These are widely used and sufficient for needs, but consistency as to how kava is treated would be beneficial – particularly for when it is marketed abroad. Beyond these classifications, the cross-Pacific data infrastructure is limited, with limited opportunities for collaboration in the kava industry specifically.

Export data are the most consistently collected data, with Fiji, Samoa, Tonga and Vanuatu all releasing timely data in a consistent manner, on either a monthly or a quarterly basis. Samoa does not include kava in its export statistics as it is not a major enough export product. The export data are readily available online. The Solomon Islands has not

released trade statistics since 2015, but the SPC Data Hub does include kava export data from both Samoa and the Solomon Islands.¹⁸

All the countries use ASYCUDAWorld,¹⁹ a system that provides raw data. Vanuatu recently launched a single window system, integrating customs and biosecurity onto one platform, helping integrate data collection across the export pathway. The data are owned by the various customs authorities, which then share it with the statistics authorities for analysis and publication. Vanuatu tests for nobility at the border, data that are not publicly available but that are being accumulated into the single window. Given the need to promote quality, improving monitoring, data collection and data dissemination at the border is a clear need.

The most common source of data relating to kava apart from exports is agricultural censuses, which are carried out by statistics authorities, which in turn own the data. These happen in all the countries examined, generally on a 10-yearly basis. The censuses generally record the number of farmers, and there is varying information regarding production (tonnage, number of plants, etc.). Fiji is the only country that collects production and pricing data on an ongoing basis. Across the region, there is increasing use of tablets and survey platforms to improve data collection.²⁰ Fiji is the only country that estimates consumption on an ongoing basis, although the Vanuatu Household Income and Expenditure Survey does include data on consumption in its snapshot.

There were no instances of data being collected on the environmental impacts of kava, which is a major gap. Table 2.2 summarises the current publicly available data.

2.10 Country profiles

2.10.1 Fiji

Kava is an 'integral part of life in Fiji' (Ministry of Agriculture, nd). According to the 2020 Agricultural Census (Ministry of Agriculture, 2020a), 18,478 households planted kava (also called *yaqona* or *grog* in Fiji), with a total of 16,018,299 plants, giving an average of 864 plants per household. The Census

17 <https://unctad.org/page/data-protection-and-privacy-legislation-worldwide>

18 Solomon Islands export data do seem implausibly low, however (discussed more in the country profile).

19 <https://asycuda.org/en/user-countries/>

20 Tools such as computer-assisted personal interviewing (CAPI) and software such as Survey Solutions.

Table 2.2 Current data collection across the Pacific

		Fiji	Samoa	Solomon Islands	Tonga	Vanuatu
Content data	Soil maps	Y				
	Agronomic data					
	Weather data					
	Area farmed	Q	Q	Q	Q	
	Production data	Q,V	Q	Q,V		Q
	Market data (price)	Y				
	Consumption data	Q,V				Q
	Import data	Q,V				
	Environmental data					
	Import data	Y	Y			
	Export data	Q,V	V	V	Q,V,D	Q,V,D
User data	Farmers	Q	Q			Q
	Domestic traders (brokers)					
	Exporters (private sector)	Q				Q
	Consumers					Q
	Research networks					
	Extension networks					
	Financial institutions					
	Cooperatives					Q
Data infrastructure	Standards	Y		Y	Y	Y
	Data privacy legislation					
	Cybercrime legislation	Y	Y		Y	Y
	Governance	Y	Y	Y	Y	Y
	Policy/strategy	Y	E	Y	Y	E
	Registries					

Note: Q = quantity, V = value, D = destination, Y = yes, E = expired.

estimated that there was a total of 6,483 hectares planted, with a total value of harvest equal to FJD 1.99 billion (US\$ 900 million). Of these growers, 34 per cent used it for own consumption, 60 per cent sold it, 22 per cent used it for social obligations and 5 per cent used it for gifts.

The 2020 Agricultural Census results indicated an increase in supply recently compared with in previous estimates. For example, PHAMA Plus

(2018a) had estimated in 2018 that there were 4,000–5,000 hectares planted by 10,400 kava growers. The Ministry of Agriculture, through its extension officers, attempts to estimate how much kava is being grown on an ongoing basis, using an online application to collect and analyse the data.

As shown in Table 2.3, kava is not grown uniformly around Fiji: it is grown by 26 per cent of all agricultural households, according to the

Table 2.3 Key kava data for Fiji

	Exports	Production	Consumption	Farmers
Absolute figure	FJD 41.9 million (2021)	13,000 tonnes (dried)	FJD 1,060 million (2019)	18,478
Percentage	2%	N/A	N/A	26%

Agricultural Census. This varies between provinces, with kava responsible for less than half the value of the harvest in the Western province (48 per cent), which is substantially lower than in the Northern (95 per cent), Eastern (72 per cent) and Central (62 per cent) provinces. This is in line with the size of the areas planted, with over half of total planting (57 per cent) of kava in the Northern province (PHAMA Plus, 2018a).

There are 13 varieties of kava grown in Fiji, all of which are noble. Kava is a high-value crop, responsible for 83 per cent of the value of the temporary crops harvested, according to the Agricultural Census. There is a large variation in farm types in Fiji, with many farmers having a relatively small number of crops.

Farmers will generally dry the kava themselves, usually in the sunlight, although sometimes using smoke too. Recently, there has been limited usage of solar. The kava is then pounded into a powder, often at a small-scale local processing facility. Given the remote locations where kava is generally grown, transportation and logistics are often a major cost and barrier for farmers. Some exporters have begun to buy kava in its green form, establishing either direct links with farmers or through trusted brokers.

Kava is consumed across the country, with the domestic market thought to be responsible for up to 90 per cent of total kava production within Fiji (PHAMA Plus, 2018a). In 2019, consumption of kava was valued up to FJD 1.06 billion, compared with FJD 823.2 million in 2018 and FJD 770.3 million in 2017 (SPC, 2021).

In recent years, however, the export market has been growing, increasing sharply from FJD 5.7 million (US\$ 2.6 million) in 2011 to FJD 41.9 million (US\$ 19.1 million) in 2021. There are approximately 120 exporters in Fiji. In 2020, the main markets for kava were the USA (74 per cent) and New Zealand (12 per cent). The USA in particular has grown rapidly, increasing from FJD 2.6 million in 2013 to FJD 29.6 million. Over the same period, the New Zealand market grew from FJD 1.3 million to FJD 5.3 million.

At the same time, imports of kava have also been growing rapidly. In 2015, imports were FJD 2.3 million, which rose to a high of FJD 20.7 million in 2019. Almost all this kava was imported from Vanuatu (approximately 99 per cent in 2019). This is a reflection of both the growing demand for kava and the damage caused by Cyclone Winston in 2016, which limited Fiji's ability to supply its markets. Imports are now declining, down to FJD 15.2 million in 2021, possibly reflecting a recovery in supply after the cyclone, or alternatively a fall in domestic demand owing to the pandemic.

Fiji launched a kava standard in 2017. The authorities are seeking to increase their level of training for farmers, particularly around quality (Fiji Government, 2020). The government is currently reviewing the Kava Act and seeking to finalise a National Kava Strategic Bill.

There has been substantial progress on accessing information where farmers group in co-operatives and associations. Training in data collection proves more efficient when addressing a group, and so is the aggregation of data collected. Fiji has now a well-established network of extension officers who oversee data collection, although concerns were expressed through interviews that the network had become increasingly focused on providing tools and seeds, rather than sharing knowledge and information, highlighting the importance of leadership and governance to achieve tangible results.

2.10.2 Samoa

Kava, or 'ava, in Samoa is an important agricultural product that drives economic development but is most highly valued for its significant cultural and traditional aspects (Ministry of Commerce, Industry and Labour, 2018). Like in other Pacific Island countries, it is always important to drink kava during political leaders' meetings, visitors, weddings and even funerals.

The main source of data for the Samoan kava industry is the 2019 Agricultural Census (Samoa Bureau of Statistics, 2019). This estimated that there were 1,366 households (Table 2.4) that

Table 2.4 Key kava data for Samoa

	Exports	Production	Consumption	Farmers
Absolute figure	WST 200,409 (2020)	No data	No data	1,366
Percentage	0.3%	N/A	N/A	5%

planted kava as a permanent crop on their own or family land, with 145 acres under cultivation. This represents a small proportion of total agricultural production within Samoa. For example, there were 16,000 households growing cocoa and 49,000 acres of coconuts.

Export revenue has been increasing in recent years, from under WST 1,000 in 2016 to WST 200,409 (US\$ 74,000) in 2020. Overall export revenue remains low, with kava accounting for 0.27 per cent of total export revenue in 2020. In recent years, the domestic market has been growing, with kava increasingly available from outlets such as supermarkets for personal consumption. The government launched its 'Ava Standard in 2018, to drive improvements in quality (Ministry of Commerce, Industry and Labour, 2018).

2.10.3 Solomon Islands

The most recent national dataset is the 2017 Agricultural Census (Solomon Islands Government, 2019). At this time, it estimated that there were just 186,360 kava plants in the Solomon Islands, across 172 acres.

Since then, kava production has been growing rapidly in the Solomon Islands, which is clear from both interviews and various media releases. For example, The *Island Sun* reports that, if you 'go to any village in rural Solomon Islands and chances are you will find someone cultivating kava, the new craze, said to be replacing more traditional crops' (Lezutini, 2021). There is, however, no clear data showcasing the size of this increase. A 2022 United States Agency for International Development (USAID) pre-feasibility study into building a kava processing factory estimated that there were 800,000 kava plants planted.

The abundance of suitable agricultural land, the low starting base and the relatively large population means that there is arguably more potential for growth in supply within the Solomon Islands than in any of the other major nations considered.

The Solomon Islands does not have the history of growing kava that many other Pacific Island nations have. This means there is not the same level of institutionalised knowledge among farmers, thus for the industry to grow well and with the required quality there may need to be more training provided than in other countries.

There is a limited but growing domestic market within the Solomon Islands, with betel nut retaining a far larger market share. The Solomon Islands National Statistics Office has not updated the international trade statistics on its website since 2015. The SPC Pacific Data Hub has some export data for the Solomon Islands as shown in [Table 2.5](#), although this suggests that in 2020 total exports were just SBD 1,008, which is equivalent to approximately US\$ 121, which is considered incorrect given the consultations. The government estimated that the country exported 15 tonnes in 2019, which, using conservative export prices, would be approximately US\$ 300,000. Improvement to the export data is needed to better understand the importance of the crop.

There are two small processing facilities within the Solomon Islands currently (USAID, 2022). As production expands, improving domestic processing capability will be an important next step.

The Solomon Islands Agriculture Sector Growth Strategy and Investment Plan 2021-2030 envisages the establishment of a Kava Commercialisation Strategy, a Kava Standard and a Manual of Good Agricultural Practices.

2.10.4 Tonga

Kava plays a crucial role in Tongan society, with Tongans believing that drinking kava is a way of improving their respect, humility, commitment and relationships. Consumption of kava during the coronations of the king, instalment of nobles, weddings, funerals and other social gatherings is regarded as an important part of the event (Government of Tonga, 2020).

Table 2.5 Key kava data for the Solomon Islands

	Exports	Production	Consumption	Farmers
Absolute figure	SBD 1,008 (2020, questions about quality of data)	No data	No data	No data
Percentage	0%	N/A	N/A	No data

Table 2.6 Key kava data for Tonga

	Exports	Production	Consumption	Farmers
Absolute figure	TOP 10 million (2020)	1,257 acres (2015)	No data	No data
Percentage	28%	N/A	N/A	No data

Kava is also becoming increasingly important commercially to Tonga, although data are limited. For production data, the 2015 Agricultural Census (Tonga Statistics Department, 2015) is the main source of information. At this time, kava was the largest perennial crop in terms of area planted, with the 1,257 acres of kava representing 39 per cent of the total land mass used for perennial crops (Table 2.6). There were an estimated 1,785,745 kava plants in Tonga in 2015, predominantly planted in a compact manner (as opposed to lines). However, this represented a fall of 76 per cent in the area of land farmed for kava compared with in 2001, a clear metric for the size of the previous kava boom.

Almost all this kava was planted by individuals (1,136 acres), with family planting taking up almost all the remainder. There was no recorded farming by co-operatives or companies. Consultations with authorities revealed that the level of kava farming had increased sharply in recent years, and this is expected to continue.

Kava farmers will generally either pound their kava themselves or sell their kava directly to a kava-pounding factory, which are generally small-scale, local operations. There are no data on the number of these businesses. Kava is a very popular product within Tonga, with high levels of consumption reported anecdotally, although there are no data on volume of consumption or numbers of drinkers. Consultations indicated that the domestic market was far larger than the export market (possibly even up to 90 per cent of kava produced), although once again there are no reliable data to estimate the size of this.

The export market of kava continues to grow, rising sharply to 211 tonnes in 2020, far higher than in any previous year in the SPC dataset (the previous high was 123 tonnes in 2014).²¹ Kava is now Tonga's largest merchandise export, with a value of approximately TOP 10 million (US\$ 4.2 million) in both 2020 and 2021, equivalent to approximately 30 per cent of total exports.

Both ground kava and unground kava are exported. New Zealand and the USA are the two main export markets, with ground kava the dominant export. Data on this are collected by the Ministry of Revenue and Customs and published by the Tonga Statistics Department. Currently, there are more than 20 kava exporters in Tonga.²²

Kava production was not severely affected by the eruption of the Submarine Volcano on 15 January 2022. The major challenge faced is lack of infrastructure to process kava at standard quality, with the Food Division of the Ministry of Agriculture taking the lead on improving standards. Another obstacle is the inconsistency of the supply of kava. The Ministry of Agriculture has a Livestream platform that could help farmers access information to promote a consistent supply of kava, although connectivity and a lack of technical skills have limited the impact of this platform so far.

Tonga has a National Kava Standard, which was developed in 2020. This includes guidelines on traceability and labelling, as well as methods of analysis and sampling, but does not include any specific guidelines on handling data.

2.10.5 Vanuatu

According to the 2020 Population and Housing Census (Vanuatu National Statistics Office, 2020b), 42 per cent of households in Vanuatu planted kava (26,000 in total). Of those who planted, 36 per cent said it was only for sale, 23 per cent said it was mostly for sale, 27 per cent said it was mostly for family use and the remainder (14 per cent) said it was only for family use. There has been a steady rise in the number of farmers recently, growing from 17,903 in the 2016 mini-Census to 26,518 in the 2020 Census, an increase of 48 per cent in just four years.

There are no consistent data on either the annual quantity of kava harvested or the number of kava plants currently in the ground. As shown in Table 2.7, PHAMA Plus estimated in 2018 that

²¹ Own calculation using data from SPC (2021).

²² Interview, Metuisela Falesiva, Deputy Chief Executive Officer, Tonga Ministry of Agriculture, Food & Forests.

Table 2.7: Key kava data for Vanuatu

	Exports	Production	Consumption	Farmers
Absolute figure	VUV 2,459 million (2021)	32,000–35,000 tonnes	VUV 3,000–4,000 million	26,000
Percentage	44%	N/A	N/A	42%

annual production was roughly equivalent to 32,000–35,000 tonnes.²³ Vanuatu will be running an Agricultural Census in 2023, which should provide a one-off snapshot into the level of production and collect further information from farmers. Data collected by the Vanuatu Primary Producers Authority suggested that, of farmers surveyed, 74 per cent were serious kava farmers (40+ plants), and for this group the average number of kava plants was 1,500. There are no data collected on the environmental impacts of this increased level of planting.

The importance of kava as an export crop has fluctuated over time in Vanuatu. The value of exports has increased sharply in recent years, more than doubling between 2016 and 2019, by which time it accounted for 57 per cent of merchandise exports, with the value being equivalent to 3 per cent of GDP. This was particularly driven by higher prices, generated by rising global demand and disrupted supply as a result of Cyclones Pam (Vanuatu 2015) and Winston (Fiji 2016). The Vanuatu National Statistics Office has recently developed a Reproducible Analytical Pipeline, which has reduced the length of time needed to produce trade statistics from six weeks to under one (Carolan et al, 2021).

There are just over 20 exporters, ranging from relatively small-scale operations to extremely large operations. Many of the exporters have direct connections to specific communities, sometimes familial, from which they source much or all of their kava. Some exporters will buy kava directly from the farmers at their processing facility. Depending on their precise business models, exporters will buy either dried or green kava, or a mixture.

The government, through the Ministry of Agriculture, has placed a minimum price of VUV 2,000 per kg of dried kava. This compares to a

general price in the islands of VUV 300–400/kg of green kava.²⁴ All kava exports will have a sample tested by the Vanuatu Bureau of Standards to ensure compliance with the 2002 Kava Act. The Vanuatu Bureau of Standards maintains its own database of samples but does not publish any of these data.

Historically, the main markets for Vanuatu's exports are Fiji, Kiribati, New Caledonia and the USA. The USA has been a key growth market over the past decade, whereas New Caledonia has declined. A number of exporters are beginning to export to Australia, and there is a high degree of hope within the industry for the future of this market.

There is also a thriving domestic market, although data collection is limited and the market is generally highly informal. It is commonly reported that there are around 300 kava bars (*nakamals*) in Port Vila and 200 in Luganville (PHAMA Plus, 2018b), and 27 per cent of ni-Vanuatu adults surveyed were reported to have drunk kava in the past week. There was a strong gender disparity here, with the figure for men (47 per cent) far outstripping that for women (7 per cent). Approximately 4–5 per cent of household expenditure was on kava; with total annual household expenditure being VUV 77 billion, this suggests that total annual expenditure on kava is approximately VUV 3.5–4 billion (Vanuatu National Statistics Office, 2020a), equivalent to just over 3 per cent of GDP.

Within the domestic market, there is almost no ongoing data collection, and consumers will rarely know what variety of kava they are drinking. A major concern about the domestic market is hygiene, with a study in 2016 by the Vanuatu Bureau of Standards revealing that 49 per cent of kava bars sampled had both salmonella and e-coli present, and a further 21 per cent had just salmonella present.

23 Vanuatu Kava Value Chain, Gender Equality, and Social Inclusion Analysis

24 1 kg of dried kava requires 4–5 kg of green kava.

3. Digitisation of the kava industry

3.1 Digitalisation versus digitisation of agriculture

Digitalisation of agriculture is defined as the use of digital technologies, innovations and data to transform business models and practices across the agricultural value chain and address bottlenecks in, among other things, productivity, postharvest handling, market access, finance and supply chain management so as to achieve greater income for smallholder farmers, improve food and nutrition security, build climate resilience and expand inclusion of youth and women (Tsan et al., 2019).

The Commonwealth Secretariat has expanded this definition through a digital agriculture framework to embody three pillars (digital innovations, data infrastructure, business development) and a base (the enabling environment). The digital innovations pillar considers digital technologies and digital services in support of accurate, precise, customised, targeted and tailored advisory services for agriculture. The data infrastructure pillar looks at up-to-date and quality user data, content data and the infrastructure that supports the data for digital services. The business development pillar answers the question: who pays for all these? Where are the sources of initial financing as well as subsequent investments for the sustainable products and services? The base of the three pillars addresses 'the rules of the game,' including digital/non-digital factors and agricultural/non-agricultural factors. The data infrastructure pillar of **digitalisation** of agriculture is the foundation for **digitisation**.

The definition of **digitisation** relates to the capturing of new information and data, or the transformation of existing analogical data into digital formats and creating databases to store the knowledge material necessary to fuel algorithms and search engines. It covers access, digital transformation and formatting of information to build databases and raises questions of ownership and intellectual property.²⁵

²⁵ Definitions adapted from www.truqcapp.com/digitization-vs-digitalization-differences-definitions-and-examples/#:~:text=If%20digitization%20is%20a%20conversion,and%20make%20better%20business%20decisions

Digitisation is a necessary precondition and a step towards digitalisation of the commodity. Digitisation enables access to up-to-date and quality content data on commodities as well as data on entities that manage the content – the users. When digitisation is done correctly, digitalisation becomes more inclusive and sustainable for the benefits of all actors, including the smallholders. In other words, **digitalisation** capitalises on **digitisation** as data become more accessible digitally. Digitisation of kava therefore requires a complex data infrastructure as a bedrock for quality and timely data. At the farm level, where past developments relied on general knowledge and an iterative approach through repeated field trials, digitisation opens the possibility of farmers being able to access a broad scope of information and sources, including historical data and lessons learnt from past experiments and crop- and location-specific data such as on precipitation and meteorology, which combination will enable tailor-made outputs delivered to farmers, all in real time for optimised crop/farm management.

3.2 Current and historical digitisation attempts of the kava industry

The focus of this section is on digitisation of kava as the foundation for a future digitalisation process. There have been a small number of attempts to digitise parts of the kava industry. Two of the most notable examples are Kava World and the Traseable D-App. Kava World was a private sector-led initiative seeking to compile a centralised database on kava and the kava culture. Traseable's work was a donor-funded project aiming to achieve higher traceability and transparency along the kava supply chain and to improve the processing time and documentation with the digitisation of the data collection. Both of these projects have since been discontinued, with both struggling to achieve sufficient traction in order to develop a sustainable ongoing model, with limited willingness to pay, low digital literacy and the small market size being key factors. Further information is available on both projects in Annex 2.

3.2.1 Kava World

In part, Kava World aimed to be a central point of information for kava online, as there is substantial information about kava on the internet just not in an easily accessible or understandable format, and there is no single clear repository of information. Much of the content is more aimed at the Western consumer markets, with individuals or businesses based in these countries providing the content. There is limited information available on non-social media websites for the Pacific Islands.

Within the islands, there is relatively widespread use of social media. For the kava industry, this can take a range of forms, some of which will involve publishing pre-existing data online. The most common is Facebook, with numerous government authorities using this tool to share information.²⁶ Similarly, many kava buyers having either business or personal pages that they use for work. Functions range from publishing price lists to promotion of their product/work to providing information or suggestions to farmers on how to improve their yields. There are also a number of Facebook groups seemingly run by individuals, including 'Vanuatu Kava infor for buyer, exporter & farmer'²⁷ and 'Kava community'.²⁸ Social media use is prevalent and so these platforms are a fairly effective way of disseminating information but they face limitations in their ability to provide information. For example, older information is hard to access²⁹ and whether someone sees a post depends on either the individual searching out the information directly or the social media algorithm putting the information in the individual's newsfeed when they are online. Social media is therefore a useful yet limited and haphazard way of sharing information.

3.2.2 Traseable D-App

Traseable was contracted under the Pacific Agribusiness Research in Development

Initiative Phase 2 (PARDI 2)/Australian Centre for International Agricultural Research (ACIAR) programme to assess the potential of digital tools used in the field and in the process of transformation of kava in Fiji. The aim was to develop a digital internal control system interface to save costs and achieve higher traceability and transparency. The system developed by Traseable had a dual purpose, to achieve higher traceability and transparency along the kava supply chain and to improve the processing time and documentation with the digitisation of the data collection.

The main challenges in the field related to low penetration of smartphones, poor access to good internet and limited digital literacy of the target population (farmers) and the subsequent fear of sharing information critical to their business and that might affect them adversely if disseminated.

Though the benefits were measured and acknowledged by the user, it proved challenging to make the tool self-sustainable and to have the farmers contribute by in feeding information. Several types of incentives were developed but farmers found it time-consuming to contribute, with little reward, since other buyers would buy their kava at the same price without asking for any data collection.

The most expensive and time-consuming part of the project was the training of the farmers to ensure they could use the digital interface and provide accurate data. The risk was to lose the quality of information collected from the farmers in going digital.

3.2.3 PacFarmer app

Another example of digitisation in the Pacific is the PacFarmer app in Fiji, which was launched in 2018 – although it does not focus on kava. This is a mobile-based digital platform for Fijian farmers and was the result of a partnership between the United Nations Pacific Financial Inclusion Programme, the Australian government, the University of the South Pacific, Vodafone and farmer co-operatives and representative bodies. The app provides farmers in Fiji access to information on government support schemes, commodity prices and weather information. Furthermore, it includes features such as 'market linkages with potential buyers, digital payments, credit opportunities and other financial services' (Reece, 2018). At the time of writing, though, there had been only 500–1,000 downloads

26 The Ministry of Agriculture Fiji has 67,000 followers and the Department of Agriculture and Rural Development Vanuatu has 26,000. Both figures are approximately 8 per cent of the country's population.

27 A group with 2,800 members that is infrequently used to provide information on the kava industry within Vanuatu.

28 A group with 5,500 members focused on the US market, providing both general information about kava and information about specific events or venues.

29 The primary method would be to search back manually historically, rather than having any form of filing system or guidance. For example, if a farmer wanted to find all the information relating to improved harvesting techniques, this would be a highly time-intensive exercise.

on GooglePlay,³⁰ the app had not been updated since September 2019 and no market data were provided. This highlights a key challenge in the sustainability of such platforms, in that it is difficult to get farmers to register, and then there must be sufficient mechanisms in place to ensure the information updated regularly.

3.2.4 Kavalogue by SPC

There is an attempt currently by SPC in conjunction with key partners to produce a 'kavalogue,' which will be a catalogue of all the kava varieties. This will be available online as an international reference, and will aim to help educate consumers, authorities and investors about the different types of kava and their properties. Given the lack of awareness about the product globally – and indeed the high level of misconceptions – this is an excellent initiative, particularly given the low degree of ongoing work – that is, once the data are published, there is limited updating needed. If this is successful, it could be further developed to include additional information

about kava. This should focus on high-level and simple information about the product that does not require regular updating.

3.2.5 The National Statistics Office of Vanuatu

In Vanuatu, the National Statistics Office has a roadmap for using satellite imagery with machine learning to map croplands and estimate crop yields in real time, at lower cost. While significant challenges remain in order to ensure that the data are of sufficient quality, the potential benefits are large. This project could be in collaboration with the Digital Earth Pacific Project, which aims to use freely available satellite data and to 'bring it together in a sensible way within the Pacific Context.'³¹ A number of authorities are at the early stage of developing applications with varying levels of complexity, although these are predominantly at the inception phase, and so limited analysis or details can be provided at this stage.

30 According to the GooglePlay app (accessed 18 August 2022).

31 <https://www.spc.int/DigitalEarthPacific> (accessed 20 September 2022).

4. Opportunities for digitisation

As outlined above, digitisation is a necessary precondition and a step towards digitalisation of the kava commodity. Digitisation of kava will open opportunities for digital innovations: digital technologies and digital services to support access to accurate, precise, customised, targeted and tailored advisory services of the commodity to agricultural stakeholders. Unfortunately, the past and current approaches of digitisation documented above do not allow for sustainable and scalable digitalisation of the commodity. Private sector digital agricultural platforms, solutions and services without a co-ordinated digitised system at national or regional level often have issues, despite isolated successes. This means there is a strong argument that digitisation by the private sector will be limited to internal processes with duplicated databases, and most of the time short-lived. Some of these digitised systems may be useful for the sector but it is unlikely that any private sector body alone will be able to digitise the wider kava industry successfully and sustainably. The concept of agricultural data infrastructure guides policy and practical actions from national governments on digitisation of agricultural commodities in support of digitalisation of the entire sector.

The concept of agricultural data infrastructure considers agricultural data as a resource just like any other resource like gold and oil. Two broad types of this resource are **content data**, covering areas such as soil maps, agronomic data, weather data, financial data and market data; and **user data**, covering areas such as data on farmers, traders, enterprises, consumers, research networks, extension networks, financial institutions and co-operatives, among others. To exploit these resources effectively and efficiently, there is a need to put in place infrastructure. Agricultural data infrastructure therefore refers to all other things that are needed to enable agricultural data management. This may include (Dodds and Wells, nd):³²

- data assets, such as datasets, identifiers and registers;
- standards and technologies used to curate and provide access to data assets;

- guidance and policies that inform the use and management of data assets;
- organisations that govern the data infrastructure;
- the communities involved in contributing to or maintaining the data infrastructure, as well as those affected by decisions that are made using it.

4.1 Digitisation at the regional level

At the regional level for the kava industry, there is clear scope for continuing to work together to open up global markets, promote the reputation of kava, drive quality and standards and protect kava's cultural and economic heritage for the region. The recent establishment of the Pacific Islands Forum Secretariat (PIFS) Kava Working Group and its current drafting of a strategy offers an excellent opportunity to achieve these high-level outcomes.

Given that kava is nearly exclusively grown in the Pacific, there is a clear case for presenting the key high-level existing information and data at the regional level, in an accessible and trusted manner. There is currently no single clear place to go to find this information, and this is a project that can only succeed if it has regional buy-in and leadership.

The kavalogue currently being developed by SPC and partners is a clear example of what proportional digitisation could look like. It is a relatively straightforward exercise, and one that is of clear benefit to all parties. There is a clear case for this intervention, with the major challenge being how to ensure sufficient users to make it worthwhile to continue to update. A similar example is the kava statistics reported in the Pacific Data Hub. Collating all this information into one place remains the key challenge. Technically, though, it is relatively straightforward, and it should focus on existing information rather than generating new data.

If this information is collated in a single place, then this could also be used as a platform for promoting kava to new markets. A simple website providing this key information, officially endorsed by the PIFS and the key producer countries, aiming to provide information, is a proportionate and feasible digitisation project. The major challenges would

³² See also <https://www.hpe.com/uk/en/what-is/data-infrastructure.html>

be agreeing on content and responsibilities, as well as how to reach sufficient people to justify the investment.³³

Beyond this, there are otherwise limited opportunities available for pan-Pacific digitisation solutions for the kava industry, with limited capacity; geographical distances; economic competition; and cultural, linguistic and economic differences meaning that any more kava-specific digitisation is most likely to happen at the country level.

At a regional level, the Pacific Regional E-commerce Strategy and Roadmap offers a detailed and proportionate approach to improving data infrastructure around the region, and supporting the implementation of this and developing capacity should remain the priority when considering the regional digital infrastructure.

4.2 Digitisation at the national level

Within countries, most of the data currently collected are on a scheduled timeframe, with few 'live' data. There is limited scope to expand on this currently, for example through ongoing collection of production data, with the major concern relating to the consistency and quality of the data collected. Attempts to develop the data infrastructure of the countries should focus on improving and supporting the statistics organisations with implementation of existing strategies and to develop capacity.

The major barrier as identified by key stakeholders is the quality of the kava, particularly at the primary stage. Given the high costs of in-person training or information-sharing, digitisation opens the possibility of being able to share this key information both broadly and rapidly. This information could range from knowledge on how best to plant, harvest or store kava, to regularly updated price lists, to urgent information in case of a natural disaster. The major advantage of this approach is that it relies only on information being inputted centrally, which allows for far greater control over the quality of the data. Because this can also be seen to be providing information of public value, there is also a case to be developed for government/donor intervention, and this would not require ongoing monetisation – a major barrier to any digitisation. That said, there

remain major challenges associated with any such approach, most notably how to ensure sufficient users. The experience of the PacFarmer app in Fiji is a good example of these challenges. Any platform should be as simple to update and use as possible, to maximise the opportunities for success. If the platform focuses on sharing rather than collecting data, then this also reduces the level of complexity of the data infrastructure required and reduces the resources needed.

Many of the farmers have limited formal business training and are outside of the formal economy. Increasing the level of formalisation of the value chain will have a myriad of benefits and is something that should be pursued across the region. Of course, this does not apply just to the kava value chain; it should be part of a broader strategy within each country. Technology can play a key role in helping drive this, for example through e-government, allowing online registration of businesses. Once again, limited human capacity is one of the major barriers here, underlying the need to improve education. Increased formalisation of the value chain should also apply across the industry, for example for logistics providers or kava bars.

The nature of the kava crop means there is limited scope for using technology at the farming or harvesting stage, for example in automated analysis of nutrients or in using technology to directly help with the harvest. The numerous small-scale farms, combined with geographical isolation, mean the costs of implementing any of these technologies is very high, with limited benefits. It is difficult to access funds for investment – particularly from the farmers. These forms of digitisation should not be pursued from a policy perspective.

There is greater scope for digitisation of the logistical chain. For example, a project in Vanuatu has recently begun to provide live tracking of interisland ships. This can help farmers plan and reduce their waste, while improving the quality of the product. As well as e-logistics, there is widespread scope for e-commerce to substantially improve the efficiency of the markets.

The private sector will continue to drive increasing levels of digitisation and traceability. This will help drive quality and grow the overall industry. There is no clear case for intervention from government or donors for supporting any individual

33 The Pacific Regional e-Commerce Strategy aims to establish a Pacific domain: www.kava.pacific would be an obvious candidate for an authorities-led regional website aiming to provide a global voice on kava.

firm with digitisation. The government should aim to support this investment by improving business environments.

There is almost no environmental data collection for kava, in part because of the very high costs associated with accreditation or inspections. Satellite imagery offers potential for more readily undertaking simple high-level analysis of changes – for example around deforestation. Given environmental concerns and the need to ensure development is sustainable, this is a clear area of interest, and rapidly improving technology will mean this should be feasible in the short to medium term. This would require government or donor support.

There is also scope within domestic markets to help to educate consumers on what type of kava they are drinking – particularly in Vanuatu, where the market is dominated by fresh kava and where there is a large number of varieties, including of

the less-desirable tudei kava. Providing consumers with this information would help drive demand to the highest quality kava, which in turn would provide a strong economic incentive for farmers to improve their planting techniques. Given the large amount of that which would need to be collected on a regular basis, and the fact that many vendors would regularly change what kava they sell, it is assessed to be too difficult to develop a platform to provide this information in real time. Instead, the clearest route to provide this information would be by educating kava vendors on standards and on what information they should be providing to their customers. With hygiene being a major issue in kava bars in Vanuatu, there also exists an opportunity for authorities to share data with the public about which kava bars have met their standards. This should be part of the formalisation process that was previously discussed.

5. Implications of digitisation of kava for digitalisation of agriculture in the Pacific

This section links the fundamental role of digitisation of agricultural commodities to the broader benefits of digitalisation within the agriculture sector in the region. While digitisation acts as a foundation by facilitating the transitioning of analogue data into digital data, the major benefit of digitalisation is that it helps reduce geographical barriers and assist with the flow of information.

This is particularly pertinent for the Pacific, given its geography and isolation, and often prohibitive costs and sparse information. Successful digitisation of commodities and digitalisation of the sector would allow people from across the region to be able to access information immediately.

Specific further potential benefits from digitisation within the agriculture sector are improving yield and crop quality; supporting education and improving access to education; improving efficiency in transport and logistics; supporting the value chain to be more inclusive of vulnerable and marginalised groups; improving traceability and transparency; enabling financial inclusion; improving market access; and opening new paths for innovation. Digitisation has the potential to help farmers improve their planting and market access decisions and general business practices. It can also help drive investment by improving the efficiency of the market. Finally, it can help policy-makers improve their decision-making and guide the sustainable development of the industry.

While the list of benefits is long and varied, a number of challenges need to be overcome in order for digitisation to be a success. These are examined in further detail below.

5.1 Barriers to digitisation of kava and digitalisation of the sector

When it comes to engaging farmers in the value chain, there are a whole range of issues to be addressed for sustainable change. These include facilitating the improvement of farming and

management practice at the production stage, as well as connecting farmers to their market. But the key drivers of change are technology, education, perceived value and the enabling environment, which relies on infrastructure and is policy-driven. This section covers a range of issues and challenges to tackle to unlock the full potential of digitisation of commodities and digitalisation in the farming industry in the Pacific region with a focus on kava. A detailed understanding of the barriers is also needed to assess feasibility.

5.1.1 Numerous small, dispersed and diverse countries

Although the kava industry is large by Pacific Island standards, by any global standard it remains small, with approximately 50,000 farmers in total, most of whom are small scale. This is a major barrier to digitisation, which generally benefits from near zero marginal costs to help justify the relatively large upfront investment costs – that is, once the technology is in place, it usually costs very little to add a user. This logic is the key driver behind many technologies in the digitisation sphere, and the small nature of the industry therefore is a key limitation to the long-term financial sustainability of any product.

In addition to this, each of the Pacific Island countries has its own unique characteristics, and this is one of the most linguistically and culturally diverse regions in the world. This diversity makes it more difficult to achieve the necessary scale for a digitisation platform to succeed, as numerous platforms of solutions may have to be developed. There are also sharp cultural, linguistic, economic and geographic variations between islands or regions within countries. This also makes sampling difficult. For example, one cannot extrapolate too much information from a study in Pentecost (in north Vanuatu) about Tanna (in south Vanuatu), even though both are two of the major kava-producing areas of the country.

The geography of the region also makes data collection difficult and expensive, particularly at the production stage. High transport costs mean that in-person data collection, the only way of collecting data from many farmers, is often prohibitively expensive for statistics agencies. The high number of small farmers further exacerbates this.

5.1.2 Financing the digitisation of the kava value chain and digitalisation of the sector

The cost of digitisation and the challenges of doing it in a commercially viable way remain a barrier to the digitisation of the kava value chain. The few related private sector-led initiatives identified in the region have not been sustainable, with the size issue above key.

Of companies providing digital agriculture services with sizeable operations in Africa, such as the Esoko model or its likes Farmerline and Cacaolink, only the latter is a crop-specific solution. Moreover, the cacao market in Africa is not comparable with the kava value chain in the Pacific in terms of scale – and we note particularly the difficulties in having a pan-Pacific solution. Therefore, the chances of seeing an industry-wide kava-specific private sector-led sustainable digitisation project are slim, particularly given the high cost of data and access to infrastructure. This is further exacerbated by both the cost of any digitisation effort and the cost-benefit perception, with many actors unwilling to take the risk as they do not perceive the outcome to be worth it.

5.1.3 Gender inclusion

Culturally, kava-drinking has been a male-only custom, reserved for chiefs. Over the years

and thanks to cross-cultural influences and globalisation, it has opened to commercial and recreational drinking, and lately to women, who nevertheless remain a small part of the kava-drinking population in Pacific countries. Youth also are kept away from kava-drinking by cultural norms.

The work involved in growing kava in the field is laborious and again mostly male-dominated. For example, just 2.1 per cent of registered kava growers in Fiji are women (PHAMA Plus, 2018a). Women play an important role in processing both locally within villages and within processing facilities. Vanuatu has carried out a Kava Value Chain, Gender Equality and Social Inclusion Analysis (PHAMA Plus, 2018b), but in general further research is required to assess opportunities to improve gender and social inclusion in the kava value chain. Access to kava value chain knowledge and digitisation needs to be gender-neutral and inclusive, especially at a time when workers' migration programmes in the farming industry are relocating a large population of South Pacific-born young males to undertake jobs in agriculture overseas, leaving the management and core of the farming business to youth and women.

5.1.4 Low levels of digital technical literacy and inclusion

Mobile internet penetration in the Pacific Islands was the lowest of any region in the world in 2018 according to 'The Mobile Economy Pacific Islands 2019' (GSMA, 2019). There are wide varieties within the Pacific, as shown in [Table 5.1](#) – for example Fiji's mobile internet penetration (60%) was more than three times as high as Tonga's (17%).

Table 5.1 Key statistics on the mobile economy in the Pacific Islands 2019

	Mobile Connectivity Index	Infrastructure	Affordability	Consumer readiness	Content	Mobile internet penetration
Fiji	60.1	59.7	66.6	78.3	42	60%
Samoa	63.8	62.4	58.8	75.3	59.9	22%
Solomon Islands	45.9	33.6	56.3	63.7	36.9	21%
Tonga	57.8	44.1	66.5	80.8	47	17%
Vanuatu	55.4	47.5	60.1	62.8	52.5	22%

Source: GSMA (2019).

Much of the use of technology so far has been for relatively basic functions, such as social media. The low content scores reflect this to some degree.

At the same time, penetration and infrastructure are rapidly improving, with increasing numbers of Pacific islanders having access to consistent and quality internet, with greater penetration of smartphones and data getting ever cheaper. The Pacific is at the early stages of enjoying the benefits of the digital revolution, and there have been numerous instances globally of digital uptake happening rapidly. The low level of digital uptake should therefore not be taken to be an insurmountable barrier.

5.1.5 Limited financial inclusion

Financial inclusion is limited across the region, with many individuals struggling to access basic financial services. For example, just 39 per cent of the Samoan adult population has a bank account, with a further 12 per cent using other formal services such as credit unions (PFIP, 2015). This is particularly likely to be the case for those working in agriculture. In Vanuatu, just 31 per cent of those working in agriculture reported having a bank account, lower than the figure for all other sectors (PFIP, 2016).

There are varying levels of uptake of mobile money across the region. For example, in the Solomon Islands, nearly 200,000 adults are using digital banking platforms (GSMA, 2019), whereas in Samoa, just 3.7 per cent of mobile phone owners have a mobile money account, even as 71 per cent of adults own a mobile (PFIP, 2015). A particular extreme example that showcases the challenges faced is that in Vanuatu in 2016 100 per cent of those working in agriculture reported receiving their income in cash (PFIP, 2016). This low level of financial inclusion may limit the forms of digitisation that are feasible.

Conversely, across the Pacific, many mobile operators are trying to set up mobile wallets or e-commerce platforms to help address these issues. Although success has so far been limited, there is no reason why these will not eventually take off. Indeed, the geographical challenges of the Pacific suggest large benefits can be had from the use of mobile money.

5.1.6 Limited human resources

The Pacific Island countries are very small, with Fiji (900,000) and the Solomon Islands (700,000) being the only major kava-growing nations with

populations above half a million. In addition, these countries are generally very young and have poor education. For example, in Vanuatu, 48 per cent of the population in 2020 was under 20 (Vanuatu National Statistics Office, 2020b), and of the adults just 4 per cent have attended university.³⁴

This has a number of implications. First, it means there is a very small pool of skilled individuals and that the institutions on which this transformation depends – governments, statistics offices, agricultural officers – are often small with limited education, capacity and training. Many of the officers are fully engaged with the day-to-day running of their institutions and thus have limited time to commit to reform programmes. These reforms therefore often depend on an individual who can see the transformative potential, and so the institutional knowledge and memory is often fragile.

The second implication is that it contributes to the low levels of digital literacy throughout the islands, making any widespread use digitisation much more challenging.

The final implication is that, from a big picture long-term perspective, it is the current young generation that will be the main driver of digitisation. This generation will have grown up with technology to a far greater extent than older generations and will mature in a world that is changing ever faster, and where digital literacy is ever more important. In the long term, the success of digitisation within the region will depend predominantly on successful education of this cohort.

5.1.7 The informal sector

One of the main challenges to the digitisation of kava lies in its informal status at the farming level. The bulk of the supply comes from disaggregated individual farmers operating outside of the formal sector, without licences and with limited data recorded. Deals are settled in cash, with weight as the main driver for price and genetics/quality coming second. Such a setup makes it difficult to accurately measure the size of the market and its economic impact. It also leads to lost revenue for governments, which are not able to measure and capture value addition

³⁴ According to <https://population-pyramid.net/>, 40 per cent of Vanuatu's population is young (15 or under), followed by the Solomon Islands (39 per cent), Samoa (38 per cent), Tonga (34 per cent) and Fiji (29 per cent).

and subsequent taxation. Authorities often have few levers they can utilise to interact with the farmers or to collect data regularly. They will often have no contact details for farmers, who in turn will have no obligation to collect or provide data.

The informal nature of kava farming poses a threat to digitisation, with limited material and data available, and makes it difficult to identify the players and value chain boundaries. Farmers in the Pacific region are usually cultivating a range of different crops and not just kava. Hence, the industry is hard to categorise, and the lack of data poses challenges to assessing the amount of time dedicated to growing kava in comparison with other crops.

Nonetheless it is critical to note that, given the high value of kava and its cash crop nature, a shift from informality has started among some farmers, who have started to organise themselves in co-operatives and farmers' associations to mutualise assets and share their knowledge and techniques.

5.1.8 Intellectual property and value

Platform-based services have become the expanding model in many industries since the digitalisation trend, which has fuelled a shift from products to services. This raises challenges regarding how to maximise the value of the knowledge collected and converted. Part of the answer lies in obtaining access to a maximum share of data at a large scale. This must trigger holistic reflection on the consequences of a shift towards data-driven decision-making to make it possible to adapt the ways knowledge and knowhow are captured.

The farming industry needs to recognise the value of farmers' knowledge and data, as these are the key to future successful business models and a driver of value through digitalisation when interpreted in the right way. Most data are currently being collected for free, but they help in building the statistics and algorithms that will make the start-ups and existing farming technology providers developing them the next big players in smart agriculture. Hence, access to the historical and site-/farmer/crop-specific data that companies will try to secure has to be contractual and possibly regulated. Farmers providing data for free may soon realise their actual value and should have a right to protect their intellectual property, with a form of return on knowledge ratio measured.

Digitisation is the key to leap-frogging knowledge barriers and bridging existing gaps; however, information has to be widely shared and accessible, especially for newcomers, to allow for scale and time savings. Ownership, security and circulation of data have to be regulated to maintain broad access and to avoid monopolistic control of knowledge that would help only a few and defeat the whole purpose of smart farming and its subsequent development benefits.

5.1.9 Processing data into agriculture intelligence

Digitisation will be successful only if there is a fundamental benefit to be derived from the collection and dissemination of the collected data. Without this, any digitisation solution will not be sustainable and will lead to wasted resources.

There is often a gap between the existing data collection and the capacity to process data into useful content. The nature of kava farming (dominated by smallholders) means that the development of algorithms and analytics allowing the farmer to digest the data into decision-making tools to improve agricultural processes is limited, and thus it is unlikely to be possible to justify the initial investment.

5.1.10 Leadership and regulation

Digitisation stands at the crossroads of agriculture and technology, and it is hard to bring the players from the two sectors and their relative stakeholders to the same table to set common goals and rules to operate on a level field and formalise the outcomes in a roadmap document. In addition, many of the changes required are relatively complex, are new to many people in the region and will encounter resistance either from those with vested interests or those who are wary of change. In such a landscape, strong leadership from key policy-makers, officials and the private sector is crucial. This is particularly true given the low capacity in the region and the many competing priorities for limited resources.

Countries leveraging the digitisation and succeeding in subsequent digitalisation all have in common governments with a vision and a strategy to create the appropriate infrastructure for the private sector to invest and compete on a level field with a light-touch harmonised approach to regulation.

5.1.11 Need for infrastructures and policies

Without appropriate infrastructure and affordable telecom services, the potential for digitisation is limited. Digitisation is likely to happen at tech company headquarters in well-connected urban areas, whereas data collection and use of smart farming are happening in rural areas with limited services and infrastructure. The geographic context of island nations and their low population densities are two major physical limitations to the development of commercially viable infrastructure and the production of digital services.

Until recently, unless governments and non-governmental organisations (NGOs) stepped into the process to invest through public–private partnerships, accepting that the telecoms infrastructure would not be commercially viable on a standalone basis but would trigger development and business, which in return would achieve a net economic profit, there was no potential for digital services in rural areas. The recent deployment of low-altitude satellites to provide telecoms services without boundaries at affordable rates is a game-changer to unlock the potential of digitisation and subsequent digitalisation and services.

Now assuming that populations living in rural areas have access to sustainable and affordable services, another barrier to overcome is their digital education and computer literacy. The development of quality content and perceptions of the value of such content are essential if farmers are to allocate time to this effort. Farmer-specific data and content that acknowledge their needs must be developed, and ways to access these must be intuitive, designed using ergonomics that put users with low education and computer literacy at ease. The platform should be in the format of a digital application, since any other, non-friendly, interface could represent a limitation to the rapid uptake and conversion of a critical mass of users to justify such investment, as shown in the Kava World case in Section 3.

5.1.12 Limited mechanisation of the kava crop

In developed countries, the scale and high level of mechanisation has permitted alliances between equipment constructors and crop science to deploy embarked sensors and monitoring devices for automated data-gathering. This generates large volumes of data in a manner that is cost-effective

but completely passive for the farmer, and ready formatted to make it possible to focus on how best to use such data. The kava industry, as a general rule, is an extremely long way from such a scenario, and it is not reasonable or feasible to expect any widespread adoption of this approach over the medium term.

5.2 Drivers of digitisation

This section defines stakeholder roles and focuses on the leadership required to drive digital transformation in the kava industry.

One of the challenges of digitisation, as highlighted in the previous section, relates to the diversity of stakeholders required to work together, and the way the leadership and roles will divide up in a 'decision-making infrastructure' that creates new dynamics and requires both the private and the public sector to work together. New alliances and business models will emerge, and public–private interactions will need to develop a level field that supports investors and competition.

5.2.1 Private sector/exporters

The private sector here is taken to mean all actors involved in the kava value chain after the farming stage. Its activities predominantly include shipping/logistics, processing and exporting kava, selling kava domestically and selling kava internationally.

Globally, and particularly in richer countries, the digitisation of commodities is often led by the private sector and dominated by agri-tech industries and equipment-builders. However, as already highlighted, one of the main barriers to the digitisation of the kava market is its low mechanisation, and thus it is anticipated there will be shift of leadership from agri-tech to IT and digital content developers with an appetite for the kava market. Given existing barriers limiting the value chain, it is unlikely we will see kava farmers take the lead in digitisation. Gaps need to closure first, and IT companies and app developers will need to identify stakeholders' needs and focus on developing digital solutions that digitise knowledge and dictate the appropriate formats for optimised usability.

A number of individual private sector businesses have made attempts to improve their own internal processes or final product through digitising various aspects of the value chain. While some of this work could have potential benefits for the wider industry,

for example in the collection of genetic data on plants, most tools are designed to benefit only the firm investing. Several businesses are pursuing traceability of their products, either for internal processes (to track specific consignments to drive quality) or for external uses (telling authorities, businesses or customers about batches). There is no clear demand from consumers for traceability yet – either for batch information or on environmental impact.

5.2.2 Donors/non-governmental organisations

Donors will play a vital role in identifying the potential for digitisation and linking stakeholders together, meanwhile de-risking the technological shift through financing of projects at early stages with limited visibility and through supporting policy and regulatory development for enhanced governance.

In facilitating the exchange of knowledge and experience through lessons learnt and field reports, donors foster innovation and cement the relationship between the target populations and beneficiaries of the digitisation, and the developers and future service providers. And, since they operate at international scale with a presence in the field in a range of countries, they provide borderless knowledge and technological bridges to leverage from the lessons learnt across all regions and locations. The NGO's role in identifying issues, supporting research and the development of appropriate solutions, and disseminating the knowledge internationally is vital.

Last, while they should be seen as promoters of digital solutions for the fragmented block-holder type of agricultural practice that best defines kava farming, NGOs may also document the transition and finance baseline studies that are key to the monitoring of both the progress and the impact of the kava culture on the economy of the region and its environmental impact. Tracking changes and defining the key metrics to measure the progression is a vital step in achieving sustainability and providing investors with more accurate data and visibility in the long run.

5.2.3 Governments

Governments of the Pacific Islands will define the policies and regulations driving kava value chain development. Given the limited resources available in the Pacific, governments need to be actively ensuring that policies and strategies are making

the most efficient use of these resources to help drive the best outcomes. They are also responsible for providing the infrastructure required for the private sector to operate and offer services, and in co-ordinating the digitisation process to try and ensure the industry develops in an efficient manner that supports sustainable development.

Maintaining tight relationships with donors and NGOs, governments will also step in with investments to boost the digitisation outcome and scale up digitalisation efforts with the right timing for a transition from the ignition phase to maturity of the technology and mass adoption of innovation. They will support the private sector to drive both the sustainability and the economical viability of innovative business models and a large conversion rate for users following successful trials and scaling efforts.

Governments should also be expected to engage and invest in the development of curricula and education to produce the qualified workforce necessary to conduct the development of the kava industry. Agricultural colleges and schools must be financed to integrate digital technology into their teaching and curricula for the next generation of farmers to be computer- and digitally literate. Governments also need to boost the IT and digital services sectors and build capacity in country or facilitate the migration of technicians to ignite a transfer of knowledge. This is fundamental to long-term success.

Governments should also consider their role in providing information to farmers, using technology as the tool to disseminate this. The focus should be on information that is seen as a public benefit to have widely available, generally for free – for example around improved farming techniques or how to safely harvest, process and store kava. For the kava industry, the dominant need is to improve quality, and many governments already have outreach programmes to work with farmers. These are limited by both time and distance, with extension officers naturally constrained as to how many farmers they can reach. However, technology allows for this information to be spread far more widely.

5.2.4 End consumers and international markets

There is limited scope for digital change in the kava value chain unless end consumers, whether in-country or overseas, implicitly endorse this and

decide to spend their money on kava products – including an extra premium if the digitisation aspect makes the final product more expensive than a similar kava product that has not been digitised.

End users will be scrutinised for their expectations, and subsequent developments will lead towards solutions to satisfy these. The quality and traceability of the product, packaging and formats are among the many variables that are end consumer-driven in the kava value chain. Given the nature of kava, its effects and medical/health implications need also to be addressed and customers educated.

In consultations, there was no push from end consumers for changes to the kava industry – for example for increased traceability or to certify a lack of environmental impact from kava farming. This limits the financial benefits for businesses to invest.

5.2.5 Farmers

Although they may be some of the major beneficiaries of digitisation, farmers are unlikely to be the initial driver of the change. They have limited

access to capital, knowledge and technology, and the scale of their operations means that it does not make sense for them to invest themselves in establishing digitisation.

Furthermore, many kava farmers are relatively content with their current way of life, which involves working a relatively limited number of hours each week, with the returns being sufficient to meet their needs and wants. Many farmers may therefore be reticent to invest additional time in something unless they see the value in it themselves.

However, farmers stand to be among the major beneficiaries, as their access to information can be vastly improved, enabling farmers to make improved decisions across the entire process, from planting to selling. Over time, as digital literacy becomes more widespread, and as the understanding of the benefits of digitisation improve, farmers will become increasingly likely to be able to accurately provide information and data back to central hubs, which in turn will compound the benefits.

6. Conclusions and recommendations

The theoretical benefits of digitisation in Pacific, a region whose economies are to a great degree defined by its geographical remoteness and distance to markets, are large. Digitisation has the potential to shrink distances and reduce barriers to trade, and allow for the seamless sharing of information, transforming parts of the value chain and enabling the Pacific to play a greater role in the global economy.

6.1 Conclusions

Kava is a high-value crop that is widely grown, and is now the major commercial crop in Fiji, Tonga and Vanuatu. Demand has been growing strongly in recent years, with Australia and the US representing particularly promising markets with potential for high growth. Supply has also sharply increased in response to high prices, which has in turn then reduced prices. However, if high prices can become the new norm then the kava industry has the potential to spread wealth and drive development across the Pacific unlike any other agricultural crop.

For the kava industry, the major barrier is the quality of the product and the ability to consistently provide what the customer wants, while the major environmental concern is deforestation, particularly as the incentives to expand supply are so strong. Data collection is limited in all countries, with international trade data being the only type of data that are collected consistently across the region. Most other data are collected rarely through censuses. There was some evidence in the consultations that this was a major barrier to the industry. While technology can theoretically help with this, collecting accurate data from the islands will often still require face-to-face interaction, and there will remain concerns about data quality.

There are varying levels of digitisation across the region. There is increasing availability of statistics and data publicly, but generally digitisation remains limited, particularly at the earlier stages of the value chain: farmers often have access only to the most basic data and information, for example through social media. The data available are generally

clear, well presented and easy to find and use. In terms of ongoing data collection, export data are the most common, supplemented by additional data collected on an irregular basis – for example through surveys or censuses. The data are usually owned by government authorities.

Given its economic importance and cultural heritage, kava is an obvious contender for driving digitisation within the Pacific. Digitisation is also highly attractive for the region as a way of overcoming its geographic isolation. Despite these potential benefits, digitisation faces major challenges. The small size of the Pacific means that economies of scale are difficult to achieve. This is exacerbated by the fact that the distance and linguistic and cultural differences between the Pacific Island countries means that building a pan-Pacific digitisation solution will be extremely difficult to achieve. In addition, for the same reasons, any attempt by the private sector to introduce sector-wide digitisation (as opposed to improving internal business practices) is unlikely to succeed.

Other barriers related to resources, digital and financial literacy, leadership, data infrastructure, data inputs and financing. The nature of the kava crop also means there is little scope for using technology as part of the farming process. This has been seen in historic attempts to introduce digitisation into the kava industry or the Pacific: most projects have failed to achieve their goals, despite often receiving additional financial support. This means that in the short term only a few forms of digitisation are likely to be feasible.

The most obvious form of digitisation to help achieve this is sharing information from the centre to farmers – good agricultural practices, weather data, transport data, etc. Platforms could have various levels of complexity, ranging from pure dissemination of simple information to including additional capabilities such as business accounting or mobile money. What is suitable and feasible will vary by country. There are also major gains to be had in using mobile money or e-commerce platforms, as well as potentially in accessing other financial services such as loans or insurance.

There is a mixed level of interest across the region in further pursuing digitisation in the kava industry. Authorities generally are most interested in pursuing their existing plans or policies, and limited resources and the small scale of the kava industry mean there is little scope or incentive for pursuing additional specific digitisation solutions.

6.2 Recommendations

Successful digitisation will be more likely to take place within individual countries and should be based on as many crops/products as possible, to maximise the potential customer base. Digitisation will likely be very simple in the Pacific, with any additional complexity affecting the likelihood of success.

The clear consensus in consultations was that quality was the biggest barrier; given this, clear consideration should be given as to how digitisation can drive quality. One of the major issues with quality is at the earlier stages of the value chain, and there are clear improvements that could be made through education or training – for example on how to dry, store or transport kava according to best practices. Farmers can also benefit from access to information – for example on sellers, prices or shipping. Given that stakeholders and farmers in the industry are so widely dispersed, access to them has historically been extremely difficult and expensive. Technology and digitisation offer a clear opportunity for stakeholders in the centre to share information outwards to farmers – for example through an application or social media – giving them the ability to reach large groups at near zero marginal cost. The major challenge here lies in ensuring the information on the platform is accurate, and that users are actually using the platform. There are many forms that this could take, and it would be most likely to work at an individual country basis – and so no specific recommendations about format are provided.

Another area for improvement is at the border, in terms of testing the product and providing clear certification relating to standards and biosecurity. There is a clear role for digitisation to improve these processes, and change is relatively feasible, in that the majority of reforms would take place at the border, which reduces the complexity. This would also of course benefit many other industries.

It is far easier to use digitisation to improve and increase the spread of data and knowledge from the centre outwards than to collect data from remote

communities. Fundamental challenges in collecting data mean there is limited scope in using digitisation to increase the level of data collection from the outer islands at this current moment in time. This lack of data (e.g., real-time production data) was also not cited as a major issue in the consultations. This is particularly true given the limited resources of statistics authorities, which are increasingly using technology and digitisation to improve their current data collection and dissemination. This should remain a core focus for the medium term.

Another focus of the authorities should be on improving the formalisation of the kava market, particularly at the farmer level but also throughout the value chain. This would enable some data collection in the short term, although concern about quality of data and incompleteness would limit the utility of these data. It would also help lay the foundations for future digitisation, noting that, as individuals become more comfortable with technology, over time more forms of digitisation will likely become feasible.

At the regional and international levels, there is also a lack of information, particularly among potential consumers, whose knowledge of kava is limited. Given that kava is grown only in the Pacific, there exists a clear opportunity for regional co-operation to develop a trusted platform for kava on which to share basic, high-level, non-controversial and non-rivalrous information – the history of the plant, the health impacts, how to consume it, etc. The goal of this platform should be to educate people around the world on kava and to promote the plant. This regional level should also be a platform for agreeing standards, including for data collection and how kava is classified.

Any evolution of the kava industry must occur in a sustainable manner, particularly given the looming threat of the climate crisis. The use of satellite imagery to monitor deforestation is a clear example of where digitisation and technology can make a clear difference in the kava industry. This is an activity that is rapidly becoming more feasible, and something that the authorities should increasingly consider. Any monitoring should be carried out as part of wider efforts to monitor deforestation.

The digital infrastructure in the region is varied, although generally relatively simple – an inevitable consequence of the size and level of development of the region. Each of the countries involved in this study is making progress in drafting and implementing its own policies in this space.

Given the resources available, continuing to implement these plans is the clear priority for digital infrastructure – a statement that holds true at the regional level too.

The level of readiness across the region to embrace digitisation is still relatively low, with key factors being low digital literacy, limited human capacity and few incentives to change. Governments and the private sector must

work together to enable the deployment of technology at large scale without restrictions to give competitive advantages to certain players, and farmers' knowledge must be valued in light of its subsequent use and monetisation. Finally, improving education to ensure that future generations have 21st century skills remains the single most critical investment for the region to drive digitisation over the long term.

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Annex A. Data gaps (WHO/FAO Technical Report)

This annex lists data gaps and suggested actions as per the WHO/FAO Technical Report on kava.

Kava varieties and beverage composition

Data gaps

- comprehensive information on the source and composition of material used to prepare kava beverage;
- information on the composition of kava beverage, with regard to both pharmacologically active and non-active components;
- availability of practical and reliable analytical methods for monitoring kava components (kavalactones, alkaloids and flavokavins) and potential contaminants.

Suggested actions

- improvements in agricultural and supply chain controls, to provide a consistent high-quality raw material for kava beverage preparation;
- further development of analytical techniques capable of identifying the chemical components of the kava plant, as well as contaminants, to ensure the compositional control of kava beverage preparations.

Kava components and their properties

Data gaps

- an understanding of the potential for formation of reactive metabolites of kavalactones, alkaloids and flavokavins, and their role in kava toxicity;
- an understanding of the potential for kavalactones to inhibit P450 enzymes, and to potentially enhance the hepatotoxicity of co-administered medication;

- an understanding of the potential in vitro and in vivo toxicity of kava alkaloids and flavokavins, and their mechanisms of action;
- the in vivo toxicity threshold levels for kava alkaloids and flavokavins.

Suggested actions

- further data on the metabolism of kavalactones, alkaloid and flavokavins and their significance in the observed toxicity in vitro and in vivo;
- further in vivo data to establish threshold levels for toxicity of the alkaloids and flavokavins.

Human health effects

Data gaps

- the effect of regular kava consumption on general health parameters over time, including weight loss and adverse effects on the liver and skin, and the threshold intake for these effects;
- an understanding of the mechanism of kava-related hepatotoxicity, for both organic and for aqueous extracts;
- an understanding of the mechanism of the kava-induced increase in GGT and its relationship, if any, with long-term hepatotoxicity, and the intake threshold for this effect;
- an understanding of the mechanism for kava-induced skin rashes (kava dermatopathy) and the intake threshold for this effect;
- an understanding of the relationship between the pharmacological effects of kavalactones and the observed toxicity in humans;
- the effect of kava beverage consumption on the incidence of chronic diseases, if any.

Suggested actions

- More systematic monitoring of the general health outcomes of regular consumers of kava beverage in order to better understand the range of potential health effects and to identify any susceptible subpopulations;
- studies to examine the threshold intake for the observed adverse health effects;
- studies to better understand kava-related hepatotoxicity;
- studies on the potential impact of co-medication with herbal preparations and drugs;

- detailed examination of any future cases of hepatotoxicity to determine exposure to kava components, contaminants and/or co-medication.

Consumption

- more reliable estimates of the level and frequency of consumption of kava beverage to determine the threshold level for adverse health outcomes;
- analytical information of the range of concentration of kavalactones, alkaloids and flavokavins in kava beverage, as well as the concentration range of potential contaminants.

Annex B. Detailed case studies of digitisation for commodities

The two projects described below aimed to digitise kava-related information and utilise it in a dynamic way. In both instances, this was the first attempt at business digitalisation and we believe it adds value to the report to show the success and failures of tangible projects whose lessons learnt could be leveraged for future trials.

The Traseable D-App

Project description

Traseable was contracted under the PARDI 2/ ACIAR programme to assess the potential of digital tools used in the field and in the process of transformation of kava in Fiji. The aim was to develop a digital internal control system interface to save costs and achieve higher traceability and transparency. Agricultural Occupancy Conditions (AOC) and Hazard Analysis and Critical Control Point (HACCP) certifications require being able to trace the product from the end consumer back to the source, which involves several stakeholders, knowing that South Pacific Elixirs (SPE) buy large quantities of kava from multiple sources who may also be consolidating from several farmers from a given community.

Need for digitisation

In order to obtain AOC and HACCP certification and match their requirements for kava products, SPE established a time-consuming paper-based data management system. It recorded batches, origin and farmers/suppliers, among other variables. It proved equally time-consuming to retrieve such information down the line when required and came with a risk of being altered through time if not stored with care.

Financing

The project and subsequent pilot were funded under the ACIAR PARDI 2 programme.

Expected outcome

The system developed by Traseable had a dual purpose, to achieve higher traceability and transparency along the kava supply chain, and to improve processing time and documentation with the digitisation of the data collection.

Challenges faced

The main challenges in the field were the low penetration of smartphones, lack of access to good internet and the limited digital literacy of the target population (farmers) and subsequent fear of sharing information critical to their business and that might affect them adversely if disseminated.

Lessons learnt

Though the benefits were measured and acknowledged by the beneficiary (SPE), it proved challenging to make the project self-sustainable and have farmers contribute through feeding information. Several types of incentives were developed but farmers found participation time-consuming with little reward, since other buyers would buy their kava at the same price without asking for any data collection.

The most expensive and time-consuming part of the project was the training of farmers to ensure they could use the digital interface and provide accurate data. The risk was of losing the quality of information collected from farmers in going digital. It was therefore recommended to start with the employees of SPE doing the data collection when on field trips and progressively training the best in class after shortlisting 'champion farmers' who had indicated an interest in the programme and technology.

From Traseable, the main win was the knowledge acquired from the agriculture sector and the new opportunities to develop tailor-made products for farmers with an aim of generating impactful cost

savings. It proved challenging for the tech supplier to run the project in a sustainable way through a maintenance fee, since the market is driven by price and there is limited loyalty from farmers. Downstream it is not obvious that end consumers are ready to pay a premium for traceability. Thus, replication seems limited to areas where this will generate substantial cost savings for the beneficiaries, with an input from a donor to cover the inception and development cost.

The challenges faced in this trial underline the need for governments to implement the right policies to incentivise both farmers and tech providers and to develop infrastructures to cope with future needs for digitalisation.

The Kava World digital community

Project description

The Kava World initiative was developed by a local aggregator and exporter of kava based in Vanuatu from 2018, after he observed that there was no centralised database on kava and the kava culture on the internet. Most traffic was on the pages and websites of US-based kava bars but there was very limited content from Vanuatu, a leading producer of kava. The sum of the digital content already available on the web was disseminated quite inefficiently. In addition, none of the existing content was designed to reflect the social dimension kava drinking involves in the contemporary societies of the Pacific Island nations.

At the other end of the partnership was a marketing agency with a focus on digitalisation and its potential for companies in Vanuatu and a vision of integrating digital technology into the kava culture. The original focus was on developing an e-shop that would unlock sales of kava. The marketing agency took on the leadership in this partnership.

Need for digitisation

Before the Kava World initiative, there was no information available at a single location to provide users with information on the locations of *nakamals*, the product and varieties, and the social life around kava-drinking in Vanuatu and beyond. The page was also developed to communicate generic information on the plant itself, the effects of drinking kava and more.

Described by its owner, this was a marketing initiative to raise visibility on drinking kava, social habits and the community bond to kava. In his own words, the aim was to blend the benefits and functionalities of Tripadvisor and Facebook for anyone interested in kava to find centralised information on what kava is and on how, where and when to drink it, and to cement a community around the kava-drinking ritual.

Financing

The project financing originated 100 per cent from the aggregator/exporter, and he always saw this as a marketing expense with limited vision on how to turn it into a financially sustainable service. Part of the capital invested was obtained through the Business Link Pacific grant initiative from the New Zealand government in support to island nations' business development.

Expected outcome

The expected outcome was two-fold: to create digital traffic and visibility on kava and the Vanuatu origin on one end, and to cement a community of kava-drinkers and get them to interact on a social media platform on kava-related matters on the other. Kava World aimed to be a reference point on kava and a place to advertise, market and sell products for exporters and *nakamals*, as a combination of a social media platform and e-shopping.

Challenges faced

On the social media platform, one of the challenges was to create content and get kava enthusiasts to interact. The creation of quality content was time-consuming and costly; meanwhile, the platform was not generating income. In order to attract other vendors and monetise the digital service through advertising, the platform had to be a level field, and the owner was not in a position to use it for self-promotion or compete with those advertising.

The second challenge was to monetise the digital content and sell advertising on the page. Shipping from Vanuatu overseas is very expensive and slow, with regulations restricting exports to a limited number of countries and demand exceeding supply, so no-one really needed to advertise. On the local market, kava is so abundant and fragmented that no-one really needed to use digital services to get a supply.

The digital format was also a barrier. The digital content was posted on a Facebook page, which was not user-friendly. An ergonomic interface on an app would have made the customer experience completely different but finances drained and it was never developed.

This project was developed in collaboration between two private sector entities but never reached out to the government for support and increased visibility. With limited funds, timing was of the essence, and to boost the number of participants and followers it could have benefited from a public-private partnership.

Lessons learnt

Though everyone in the kava community loved the concept and participated in sharing information and posts, no-one was ready to pay for a digital service and advertising was not conclusive in a market with demand exceeding supply. With an export market

essentially driven by wholesalers, the timing of the launch of the platform was not ideal. A few years down the line, with the opening of the Australian market to domestic consumption of kava and new formats of retail products fitting postal service requirements, the conditions are more prone to leverage the digitisation of content and to monetise such a service on a platform where fragmented small-size suppliers can access a centralised e-shop.

A digitisation project of such a magnitude aiming to provide digital services should not restrict itself to the private sector. The challenges faced in trying to change the habits of kava-drinkers, to get them online services and to build a new pool of customers were too ambitious with limited funding. Donors and government should be mobilised to increase visibility and maximise follower/customer intake in such a project for a swift and large conversion rate, which will be key to financial sustainability.

Annex C. List of consultations

Organisation	Organisation type	Country
Australian Centre for Pacific Islands Research	Research	Australia
Department of Agriculture and Rural Development	Government	Vanuatu
Fiji Bureau of Statistics	Government	Fiji
Fiji Kava Ltd	Private sector	Fiji
Fijian High Commission in Britain	Government	UK
Forney Enterprise	Private sector	Vanuatu
Kava exporter	Private sector	Solomon Islands
Krakatoa Ltd (kava importer)	Private sector	USA
Lami Kava	Private sector	Fiji
Ministry of Agriculture	Government	Fiji
Ministry of Agriculture and Fisheries	Government	Samoa
Ministry of Agriculture, Food & Forests	Government	Tonga
Ministry of Tourism, Trade, Commerce and Ni-Vanuatu Business	Government	Vanuatu
National Public Health Lab, Ministry of Health	Government	Solomon Islands
Pacific farmers	Private sector	Fiji
Pacific Island Forum Secretariat	Regional body	Fiji
Roots of Happiness (kava importer, kava bar owner)	Private sector	USA
Talanoa Consulting	Private sector	Fiji
The Pacific Community	Regional body	Fiji
Traseable Solution	Private sector	Fiji
Vanuatu Bureau of Standards	Government	Vanuatu
Vanuatu National Statistics Office	Government	Vanuatu
Vanuatu Primary Producers Authority	Farmers association	Vanuatu

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