SAMOA HERBS

Ava Samoa
Growing Guide

Introduction

This is a very simplified guide to Ava growing in Samoa, planting Kava (Piper methysticum Forst. f.) in soil that has previously been used for crops or has been cleared for pasture, present many problems not present when first or secondary growth forest is cleared for planting, this is due to the reduced nutrient level of soil, yet in order to preserve our environment it is important to save our forest. This guide focuses on repurposing or rejuvenating soil to re-establish fertile qualities required to grow kava successfully whilst using little or no imported fertilizer, also it can be followed to maintain soil fertility in land presently used for Ava farming.

Site selection

In Samoa Ava grows best from near sea level up to about 400m, in relatively deep, loose, fertile soil on sloping land so water does not pool, annual rainfall needs to be high 2,200mm+, dry El Nino years are a major threat to Ava thus it's important to plant shade trees that are not trimmed until the rainy season has fully set in, shade for part of the day is best, Ava does not produce deep roots thus creating and maintaining soil fertility of the top layer is vital to gaining a high yield of Ava roots as it is the roots that have the highest concentration of kavalactones.

Ava supporting trees (Gatae/Dadap/Erythrina variegate) should be planted at 8-10m spacing to provide shade and improve soil fertility, if a lot of earthworms are present this indicates Ava will grow well provided the soil fertility and moisture is maintained.

Windy areas require wind breaks such as, Dadap (Gatae/Erythrina variegate), Castanospora Alphandi (Tamaligi ululi), African Tulip tree (Fa'apasi/Spathodea campanulate), Gliricidia sepium is also growing in Samoa and is a good shade and soil improvement tree, Ava stalks easily twist and split in strong winds, these splits allow disease to enter causing stalks to rot right down to the roots.

Soil fertility

(The soil needs to be of good quality (deep, light, fertile and rich in organic matter) and well drained. Deep, loose, fresh friable soil that is rich in organic matter is best for kava production. Optimum production can be achieved from silica-clayey soils with a pH range of 5.5 – 6.5.) This is from the Fiji Kava Quality manual. Soil in Samoa is different and very rocky in most areas.

Highest kava yields occur on silica-clay soils, Samoa has geologically young volcanic soils which is generally rocky, topsoil can be deep in areas but varies according to lava substrata, making it difficult to achieve the long root system associated with Vanuatu or Fiji kava. Newly cleared forest has been the best way to produce vigorous growth in Ava plants due to the high fertility, but cutting down forest is not a sustainable method on our small islands.

How can we simulate a natural forest cycle? First we need to understand why trees help soil quality, tree species have different root structures some deep with tap roots, others shallow complex roots, all draw nutrients up into leaves and branches which then fall to the ground, to decompose making available minerals to plants that have shallow roots like Ava.

Soil also has a very complex web of fungi and bacteria that create active, healthy, fertile conditions supported by a complex deep root structure (palapala ola). When we clear cut forest understandably we drastically change natures balance, thus fertility lasts only a few years then we tend to cut down more forest, this is not good for water retention, air quality, or for our birds and our environment in general. If we do not work with understanding, nature will collapse and our small islands will soon have deforestation problems like the island of Pohnpei, or end up baren like Easter Island, or Malta, making agriculture very difficult, we need to preserve our forest and learn how to successfully reuse land already cleared. This method is today called carbon farming or regenerative farming, it is gaining more following as people realise we cannot continue to upset the balance of nature

if we want healthy plants that support our own health.

The Ministry of Agriculture and Fisheries Nu'u farm have a range of plants that are compatible with Ava farming. Examples of trees that have superior qualities to improve soil are, Dadap (Gatae/Erythrina variegate), Castanospora Alphandi (Tamaligi ululi), African Tulip tree (Fa'apasi/Spathodea campanulate) *Gliricidia sepium* is also growing in Samoa, these trees either have a deep tap root, complex roots or nitrogenous nodules that contain a symbiotic nodules of bacteria and fungi on the roots, which process soil minerals to feed trees, in return trees give sugar to bacteria and fungi, trees die and rot also feeding the soil. It is how trees breath in CO2 removing it from the atmosphere, whilst exhaling O2 that we breath in, we breath out CO2, it is a cycle. Plants convert CO2 and minerals from the soil into fibre and sugars that feed bacteria and fungi creating natural fertile soil that stores more carbon, many developed countries have removed the majority of their ancient forests to grow food crops, grains, farm cattle, sheep etc, the result is soil that requires high amounts of fertiliser, and is missing trace minerals that are vital to good health, let us not repeat their mistakes.

Best we work with nature to optimise soil fertility without using costly imported fertiliser. The agriculture department Nu'u farm have a few ground cover solutions that will assist farmers in weed control and maintaining moist, fertile soil.

When preparing planting plots try to disturb the soil as little as possible, only dig up rocks necessary to lightly loosen soil for Ava planting, this way soil is least disturbed and able to quickly help new Ava roots gain all nutrients needed to grow strongly thus resisting disease and grow beautifully strong. Digging deep and turning the soil upside down is going to mess up the natural arrangement which then takes time to re-establish so it will be slow to provide ideal growing conditions for your seedling roots to develop rapidly.

Ava variety

Ava Samoa has been a traditional crop for ceremonial and social use, it is becoming an important cash crop both for our local market and export. Samoa does not have wild Ava but some false Ava have been imported, for export Only NOBLE Ava varieties are permitted although medicinal Ava like Ava Le'a Lua and Ava Sa might be of interest to pharmaceutical companies. Noble Ava are varieties that have 4 and 2 as the first two kavalactones in the chemotype. The Samoa Kava Standard defines noble kava as having the first three kavalactones in a chemotype as 246 or 426 unfortunately this will unnecessarily restrict the varieties of Ava we can export, Vanuatu the leading Ava exporter defines noble kava as having the first two kavalactones as 24 or 42, and thus a famous Vanuatu kava having the profile Borogoru 245613 and another Borogu 423561 are high demand Ava exported from Vanuatu but in Samoa these would not be a permitted export, we should be guided by Vanuatu.

Kavalactones are unique compounds Ava produces that create the varying effects felt when we drink Ava and are the reason we have an opportunity to serve the world through our efforts to grow good quality Ava. Kavalactones do not dissolve in cold water, what we drink is a suspension of fine particles that are acted on by gastric juices and released into the blood stream, the finer the Ava particles are pounded the faster and stronger effect. A higher percentage of roots or only roots have a stronger effect, because in a mature plant the highest percentage of kavalactones are found in the finest/smallest roots, reducing from 20% in the fine roots to 12% as the roots get larger, the stump usually has 6-11% kavalactones. The lowest 5 nodes of Ava Le'a have been tested at 3.2%.

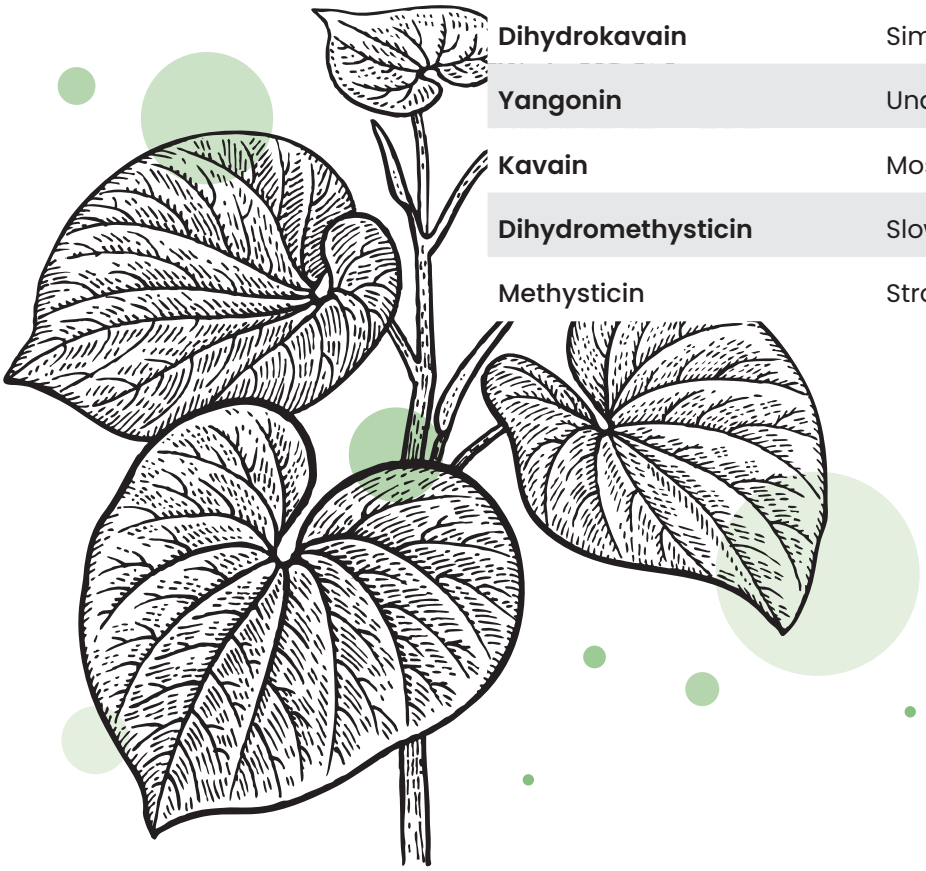
There are more than 15 kavalactones, the combinations produce differing effects, the first 6 kavalactones in a profile comprise 96% of the total with the first 3 being approximately 70%, so buyers look at the first three kavalactones in a variety first to determine a good Ava, but there are varying percentages of the individual kavalactones that result in significant differences on an individual's experience.

Research has shown that Kavalactone levels generally peak at 18 months but the biomass continues to increase reaching a good economic value at 30-36 months for Ava Le'a, Ava La'au and Ava Mumu. Ava Talo because it retains more moisture until almost 3.5 years is best harvested between 42-48 months, the danger of leaving your Ava crop past 4 years is that, in many areas, nematode damage to the roots and stump increase significantly. Keep in mind we need to meet export quality.

Although in general a particular variety will have a stable kavalactone profile, changing weather ie more or less sunlight, more or less rain, or attack by various pathogens can result in differing percentages of kavalactones in a particular variety, after all it is nature. The best results are generally when harvest is during the dryer periods of the year at between 3-4 years, we need to keep in mind the economic aspect, so we want the minimum time for our return on investment whilst providing export quality Ava, time is money.

If Ava Samoa is to compete well with the best Ava from Vanuatu, Fiji, Tonga, Hawaii, the Solomon Islands and Pohnpei, we must plant our best. There are two known noble Ava types that might be planted; Ava Le'a, and Ava La'au these have the qualities that the international market demand, today most of the Ava in Samoa is Ava Talo, this tastes great but it has a kavalactone profile that tends not test as a noble type. A relaxed social interaction is the prised effect the export market desire. If we want to easily sell the results of our sweat, then it is best we give the market what it wants.

The list below are the 6 kavalactones making up to 96% of total kavalactones.



Demethoxy-yangonin	Undesirable
Dihydrokavain	Similar to kavain uplifting
Yangonin	Undesirable
Kavain	Most uplifting effect
Dihydromethysticin	Slow effect
Methysticin	Strong Analgesic effect

Why should we understand the different qualities of Ava? It is unfortunate that many have not retained knowledge of Ava from the past, this has resulted in many believing Ava is Ava, and yet there are many varieties of Ava Samoa that were identified by a Vanuatu based scientist in 1987-89 (Dr Vincent Lebot.) these were identified as; **Ava Samoa, Ava Ulu, Ava Le'a, Ava La'au, Ava Mumu, Ava Talo, Ava Sa, Ava Le'a Lua**. There are no doubt other varieties that have yet to be named or identified.

Each variety has a special effect for example; Ava Le'a is uplifting and encourages communication, Ava Mumu is very calming without sleepiness, Ava Talo encourages a good night's sleep, Ava Le'a Lua is a powerful analgesic but even two to three cups will cause nausea.

More importantly, time to maturity is a consideration from a commercial aspect; Commercially Ava should not be left for more than 4 years. Why? In considering export quality, soon after 4 years healthy Ava often shows root damage from nematodes, which allow fungi and other insects to invade and damage your Ava crop reducing quality and making it unsuitable for export, it is recommended that between two and three noble varieties be planted and harvest at 3-4 years when yield to time is optimal. The most popular daily drinking Ava have 426 or 246 as the first three kavalactones in a profile, but even then there can be slight variations in percentages of the individual kavalactones that noticeably influence the effect and enjoyment. The modern buyer is becoming very discerning and knowledgeable of the names of the best varieties from each country.

Ava Talo

Ava Talo the most common variety now is slow to be commercially viable because it retains more moisture, which is good for dry parts of the year, but means excessive shrinkage when drying so there is less financial return until the plant reaches 42 to 48 months, at which stage moisture level drops and after drying Ava Talo gives higher yields. This variety seems to be the easiest to grow in most areas, also it has higher survival during dry spells, the problem is the kavalactone profiles from tests at SROS have been 246, 426, 423, 463, 462, as can be seen under the Samoa Kava Standard three out of five are not a noble variety, whilst under Vanuatu rules three are noble and two not. HPLC Testing is accurate and vital for export.

Ava Le'a, Ava La'au and Ava Mumu

Ava Le'a, Ava La'au and Ava Mumu all have a viable harvest from 30 months onwards and ideally 36-48 months, even at 24 months if well cared for on a fertile site, good quality and quantity can be achieved with these varieties. Ava Le'a requires careful monitoring until around 9 months when it has established a good root system and then grows well, Ava La'au and Ava Mumu generally grow easier and can have quite vigorous early growth in good soil. Ava Le'a 426351, Ava La'au 426315 are both noble varieties, whilst Ava Mumu tested 246351, 254361 Ava Mumu like Ava Talo will need more research to understand the causes of variation, it may be that plants may look alike whilst they are actually different chemotypes, this is often the case in Vanuatu where the drinking qualities are what determine if Ava is replanted whilst morphology is not important.

Ava Le'a Lua

This Ava does not produce a large rootstock and it has a kavalactone profile that is not permitted for export 642451 (It is not a NOBLE Ava.), but it is a strong analgesic, this attribute must be explored by SROS, and advice will follow. Ava Sa and Ava Le'a Lua were most likely used by taulasea/fofo for its strong pain relief effect and for the same reason it may be of interest to the pharmaceutical industry.

In order to service an export market that wants a particular effect/variety it is important to plant a single variety in each plot (pu'e Ava) and not to mix varieties when harvesting. This way we preserve the varieties and knowledge of:

- How to care for each type
- How each variety tastes
- What effect is felt
- When to harvest to gain the most money for our efforts whilst providing the best quality in the least time
- How to differentiate one Ava variety from another.

It Is easy to Identify Ava Talo, it has soft roots easy to break off, it rots easily after harvest, it is not mature until 3.5 years, the stump (Ata) when dry turns powdery when pounded unless it is 3.5-4 years. The shrinkage when dry results in much lower yield ie. It contains more moisture than other varieties until it is mature at 3.5-4 years. It tolerates dry weather better.

Testing before export in order to confirm the noble kavalactone profile is important, HPLC is the preferred test as NIRS is evolving.

Planting material

Traditionally once Ava is harvested the branches are replanted, farmers generally first prepare new planting plots by removing rocks and loosening soil, then branches are cut above the stump and removed for planting, lower thick and woody parts often do not germinate, middle section usually germinates well, the thinner tip part of a branch can establish quickly during wetter parts of the year but require care and immediate planting, any delay will result in moisture loss and decreased chance of continued growth.

Branches removed then harvested.

The best time to start planting is the beginning of and during the rainy season, although too much rain can cause water logging which can kill early growth. A minimum of three nodes (Sometimes 2 nodes are sufficient.) are cut depending on the thickness and length of internodes, one or two nodes are placed under soil at a slight angle, if planting material is healthy, green, and fresh, 5 pieces is enough per plot (Pu'e Ava) more if there is doubt of germination, there are some who have plenty of planting material so they place as many as 10-20 in large prepared plots.

For commercial considerations it may be desirable to have more smaller plots per acre that have good nutrient zones, rather than large plots which may require more time for the many Ava plants to gain mass, also many competing plants can create a jumbled mess of smaller biomass which is more difficult to clean and process, an important consideration for export.

Do not damage pieces of planting material, use a planting stick to form a hole and slide the planting material in taking care to protect the skin and growing eye (Mata). Do not plant upside down ie the same orientation of the growing Ava branch is necessary for the planted piece.

If you choose to trim branches from healthy growing Ava plants for planting material, please make sure you use a sharp knife or sharp pruning shears to prevent splitting the branch (Splits can cause pathogens to invade), cut clear above a node that has a growing shoot (Tatupu) so any rot will stop at the healthy shoot and not progress all the way to the stump causing it to rot completely, ruining your crop.

Large sheers

Agricultural advisors recommend only using healthy planting material, this is a good idea although it seems that the Ava plant has on its skin almost all the pathogens that can affect it, for example; a single Ava plant can have one branch healthy free of CMV (Cucumber mosaic virus.) whilst another branch on the same stump can be showing effects of CMV, therefore it is more important to have vigorous healthy growing

plants that will have strong resistance than trying to identify CMV free planting material. With experience it will be easy to identify parts that will grow well.

Spacing depends on the rocks. Samoa is volcanic and geologically young so most areas are rocky, this is also the reason that a smaller percentage of roots is recoverable (33-45%) when harvesting unlike other Pacific Islands such as Fiji, Vanuatu and the Solomon Islands (60+%).

If mono cropping Ava, rows have been placed 2m apart with plots 1m apart, this is high intensity and requires very careful maintenance to minimise issues.

For regenerative farming technique ideally 3m circumference around plots, taro can then be planted in between Ava, with Dadap (Gatae) planted every 8-10m, this will give favourable results, the Dadap (Gatae) can be trimmed and mulched (Fa'amalu) at the end of the rainy season such that they have full foliage during the dry season to protect Ava from the sun and maintain moisture in the soil. When rains return, trim Dadap (Gatae) and mulch to provide nutrient boost for Ava plants. Ava has shallow roots that do not generally extend more than 3m from the base after 3 years, thus good nutrition within this range must be maintained.

Many farmers intercrop with taro this provides shade to the growing Ava and cash/food after 6-8 months, this can be followed by cocoa trees when taro has been harvested and a second crop of Ava is not planned in the same area. (There are areas where up to three ava crops can be harvested consecutively from the same plot.)

There are many methods for planting Ava in Samoa and around the Pacific, what is best for each farmer depends on time, resources, location and experience.

While Samoa has 8 identified Ava varieties, Vanuatu has the most Ava varieties (100+) and have long studied methods for planting. To increase the chances for plants to germinate and grow well, plant into the field when the rainy season begins or is ending, some years have better distribution of rain that allows a longer period of planting, generally the thickest woody lower nodes of a branch do not germinate well, the middle section usually germinates well, and the softer upper branch gives good results if planted immediately in fertile moist soil during the wetter part of the year, protect plots from sunlight by making a shelter with sticks covered in grass or vines. Nurseries must have shade.

1. Direct planting is common in Samoa and is achieved by using cuttings from healthy branches of 2-3 nodes, one or two nodes are inserted underground, be careful not to damage the skin of planting material, after loosening soil and removing large rocks, use a stick of the right size to form a hole and slide the planting material in as you withdraw the stick then firm up the soil around the planted ava, be sure to plant the piece right side up as it is on the growing plant or it will not grow.

2. As a nursery method plant a length of branch in a shallow trench being carful not to damage the branch, cover with half an inch of soil, cover with dry grass, water regularly, when the plants sprout and are healthy cut to separate plants free from tits neighbours, transplant into plastic bags, being careful not to damage roots, transplant to the field when strong and healthy.

3. Using plastic bags or make seedling boxes with used oil containers cut in half with holes, filled with very good soil, plant single nodes with the bud/Maka facing up cover with a little soil and a piece of newspaper, keep moist and transplant during the wet season when the plants are strong.

4. Cut healthy middle sections of ava branches into single nodes and lay in the shade on newspapers, cover with more newspaper and keep moist until the nodes sprout, not all will, transplant germinating pieces into plastic bags or seedling boxes containing good soil until the plants are strong enough for trans-planting during the wet season.

There are 4046sq meters per Acre, with mono cropping 4046 Ava plants/plots might be possible, for regenerative/carbon farming where we plant advantageous trees, ground cover, taro or cocoa with the Ava, consider 1,600-2,000 Ava plants/plots per acre this will after 3 years generally yield 16-20 ton of fresh Ava or 3.2-4 ton of dried Ava, based on 10kg per plot although in some areas as much as 24-28kg per Ava plot has been achieved at 4 years. To achieve the best results, regularly ridge or mound up soil around the base of the kava plant to encourage new shoots, discourage weeds and stop the rhizome/roots being exposed to light. Adding compost and animal manure will ensure robust growth, if imported fertiliser is applied be very careful to only apply a small amount and keep it clear of roots to prevent burning, three monthly application intervals might be considered.

Spacing kava when planted as a single crop

As can be seen from the figure above intensive farming of Ava is very close spacing and where it is practiced, generally half is harvested at 30-36 months, half again at 4 years and the remaining at 5 years, this method requires careful consideration, factors such as soil fertility, general weather patterns in the location, surrounding land use and regularity of inspections for debases.

For export only the stump (rootstock) and roots should be used, no lower branch storks should be considered for export in order to ensure top quality.

Pests, diseases and weather

Cucumber Mosaic Virus (CMV)

Cucumber Mosaic Virus (CMV) is also known as the cause of Kava Dieback disease, certain plants host CMV, these are; Bananas, cucumber, tomatoes, pumpkin, tobacco, corn and others, if possible they should not be planted with Ava.

This disease (CMV) seems endemic in the kava around Samoa thus even when healthy planting material is used, kava can develop CMV if stressed, the best defence is to take every action to ensure strong healthy growing Ava crop.

Cucumber Mosaic Virus CMV/ Kava Die back

African snail

This is a major problem, in most areas especially for young or sprouting plants. Although snail pellets are the only solution at present, if you have ducks they will eat snail eggs, juvenile snails and slugs, reducing the problem, also ducks do not scratch and dig up soil as chickens do. Also flat worms kill African snails

African snail

Ants

Ants especially an introduced variety known as Singapore Ant have a symbiotic relation with mealy bugs which are sap eating, causing damage to the skin of a plant allowing CMV to enter, which results in Ava dieback. Certain plants can host CMV, these are; Bananas, cucumber, tomatoes, pumpkin, tobacco, corn and should not be planted with Ava. Ant sand is available at Chan Mow supermarket in Apia it needs to be mixed with icing sugar to ensure ants take the bait to their nest thus destroying the colony, unfortunately regular treatment is necessary due the prevalence of ant colonies. Areas with the native large black ants(Loata) remain free of this pest.

Nematodes

Nematodes are not visible to the eye but the damage they do is easy to see especially in the roots which get lumpy and rotten, it seems the damage is often worse after 4 years, nematode damage allows fungi and other insects to attack roots and stump resulting in substandard ava making it unsuitable for the export market. Some varieties of nematodes can be discouraged by planting turmeric near Ava, this is a good secondary crop but caution must be exercised if harvested before the ava as damage to ava roots must be avoided.

Nematode damaged roots

Kava weevil

Kava weevil is sometimes found in the stump and can allow fungi to establish ruining quality, vigorous growth and harvesting around 4 years reduces this and most other Ava farming problems.

Kava weevil (1) and possible larvae of kava weevil (2)

Dry weather

Dry weather is the enemy of Ava, so it is important to be aware of the general annual weather conditions in your area, for example Asau can experience very dry weather from July through to October, September is usually the driest month for Samoa.

How can we protect Ava plants during dry spells? Planting shade trees such that the sun shines fully upon the Ava plant for half the day or less by planting a row of Dadap (Gatae/Erythrina variegate), Castanospora Alphandi (Tamaligi ululi), African Tulip tree (Fa'apasi/Spathodea campanulate) between every two or three rows of Ava this will also protect the Ava from wind, contact MAF Nu'u plantation for good ground cover recommendations, many farmers let grass grow through the dry season only weeding around the base of Ava.

Cyclones

What can you do to minimise the damage and ensure rapid recovery of your Ava crop?

One needs to be proactive, when you are sure a cyclone is imminent then using a sharp knife or plant sheers, cut Ava branches about 4 nodes (Depending on variety) above the stump and if possible above a sprouting branch to prevent rot from setting in. Within three months after the cyclone, plants will recover rapidly, although a few may not. Alternatively trim as required and use pruning paint to cover the cut branch and prevent rot, in this case recovery of the crop is rapid and robust.

Trees

Take note of trees that prevent Ava from growing well such as; Kofaso is very bad for Ava, Aoa, Pualulu, Pulu mamoe, and Guava trees which attract ants so must be removed.

Harvesting

First cut all the branches about the first node depending on variety, and use for replanting and expanding your Ava plantation. Harvesting is a job that requires patience and a gold diggers mindset, because the roots fetch a higher price and have the highest kavalactone content these must be carefully dug up, using a pitchfork loosen as much as possible soil around the plant then carefully find roots (Feel by hand, dig and follow them, don't break the roots.) then free roots from the soil, even when lifting the stump (rootstock) and roots out, note broken root ends to help find and dig up the remaining accessible roots, rocks will always be a problem, there should be at least 40% of the total weight harvested as roots, some have achieved as much as 65% roots, you do not want to leave your hard earned money in the ground when you harvest.

When washing Ava note that roots or stump that have been exposed above ground will have chlorophyl (green skin like the upper branches), this skin must be removed as it contains toxic alkaloids. The underground outer skin surfaces must be thoroughly cleaned of any soil, preserve inner skin layers as they are high in kavalactones. A good method some use, achieving good results, is after soaking in water with a small amount of detergent for a few hours/overnight, or freshly harvested Ava, is a medium pressure (1,700-2,000psi) water blaster.

The lowest 3 nodes of some Ava varieties can be peeled of all green skin and used although the kavalactone content will be low, note this is not true of Ava Talo which has lower branches that when dry turn to dust when pounded. When drying Ava, ensure no animals, or contaminants get mixed with the drying Ava chips and roots.

1kg of dry Ava requires 4-6kg of fresh green Ava, depending on the variety, age and parts, a good average is 5kg of fresh Ava = 1kg of export quality Ava. Drying must reduce moisture to 12% or less to be safe, and acceptable for export, the pieces should snap with a clear crack sound, if they only bend then it is not dry. To gain the best results it is important when chopping Ava for drying make sure the pieces are not too large, if larger pieces of Ava are dry on the outside but moisture remains in the middle it will allow mould to develop (pologa), this mould produces toxins that are dangerous and cited as causing liver damage.

Not dry in the middle, mouldy

The main points/checklist for Ava farmers

- Grow noble Ava varieties
- Organic cultivation if possible is encouraged, follow regenerative farming methods to preserve our environment.
- Use good fresh soil in nurseries, plant healthy seedlings or planting material
- Plant on sloping land to allow water to run off
- Mono cropping is not recommended, avoid mixed cropping with plants that host CMV, such as cucumber, pumpkin, tomato, watermelon, chillies, banana or ginger.
- Beneficial plants are; Dadap (Gatae/Erythrina variegate), Castanospora Alphandi (Tamaligi ululi), African Tulip tree (Fa'apasi/Spathodea campanulate), Gliricidia sepium
- Plants that reduce nematodes: Turmeric, marigolds, Eucalyptus
- Apply mulch, compost, or pile up earth around the base and above ground roots.
- Constantly check your farm for unhealthy plants, try to determine why, trim and burn diseased branches or plants.
- Control weeds, through ground cover plants, mile a minute can become a problem. It may be useful to weed only the base of Ava whilst letting the grass cover protect the soil moisture.
- After harvesting, it may be better not to replant Ava in the same place, allow the soil to rest by planting cover crops and dadap trees.
- Keep records of the, section harvested, Ava type, age, plots harvested, weight of roots, weight of stump, note nematode damage or any other problem.
- Grow Ava for 3-4 years before harvesting for export
- Wash Ava thoroughly after harvesting
- Use sharp clean knives for separating roots, stump, and lower stalks, remove poor quality pieces
- Remove any green skin from roots and stump that were exposed to sun light, chop into even sized pieces that will dry evenly and rapidly
- Dry the Ava thoroughly (Snaps), on clean tarpaulin, keep it off the ground, protect from contamination; Soil, insects, animals, plastic, grass or rubbish, rain, smoke, dust, smells
- Remove poor quality Ava, pack for export, roots and stump separately, in new clean sacks, Mark sacks with Exporter name, Date packed, type of Ava, parts packed, source village, and PRODUCT OF SAMOA.
- Keep the sacks dry, clean and free from damage. Label with weight, Exporter name, Date packed, type of Ava, parts (Roots-Uso/stump-Aago), source village, and PRODUCT OF SAMOA.
- Before export, samples must be tested for kavalactone profile and total kavalactones. HPLC is the gold standard. Noble Kava is the only variety for general consumption, non-noble varieties as agreed to with the buyer.

Co-operation

Considering the labour shortage in many villages as many have left for seasonal worker scheme contracts, it may be worth considering formation of Ava farmer co-operatives in various regions or villages to share resources especially for the most labour intensive parts of Ava farming the preparation and planting, later Harvesting, washing, drying and pounding.

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6. The Contemporary Pacific, Volume 21, Number 2, 265–297 © 2009 by University of Hawai'i Press
7. Fiji Kava Quality Manual. Prepared, printed and distributed with assistance from the Australian Government and New Zealand Government
8. Samoa Kava Satandard 2018
9. Personal farm experience.

Annex 1:

Kava Production Cost and Income

Basic Data/acre	
Plant Spacing (m) 1.6 x 1.6 = 2.56sqm @	Rural villages generally do not follow minimum wage rules as extended family will chip in to help, the favour is always returned in one form or another.
Plant density 1,600 per acre	
Average price Fresh harvest WST$11.50/kg	
Average price dried harvest WST$57.50/kg	
Harvest at 3 years (Commencing 30-36mths)	
Yeild range 10 - 25kg - conservative 10kg for projections.	

Gross Income	Years	1	2	3
Yield (kg/fresh)		0	0	16000
Price ($/kg)		$11.50	$11.50	$11.50
Total Gross income Fresh		**$-**	**$-**	**$184,000.00**
An Exporter of dry kava has more Quality control issue				
Yield (kg/dry)		0	0	3200
Price ($/kg)		$57.50	$57.50	$57.50
Total Gross income Dry		**$-**	**$-**	**$184,000.00**
Variable costs				
Planting Material Seedlings @	$20.00	$32,000.00	$-	$-
Tools		$315.00	$350.00	$385.00
Total variable costs		**$32,315.00**	**$350.00**	**$385.00**
Labour Inputs (days/acre)				
Fresh				
Land preperation and planting		72		
Maintainance		36	36	36
Weeding		120	120	120

Harvesting			50
Total labour days	228	156	206
Labour cost per day WST$30.00 (food not incl.)	**$6,840.00**	**$4,680.00**	**$6,180.00**
Annual costs	$39,155.00	$5,030.00	$6,565.00
Gross income	$-	$-	$184,000.00
Total cost			$50,750.00
Net income fresh			**$133,250.00**

Additional labour costs to clean, chop and dry harvest

	Labour Days	
Labour input for drying harvest	135	$4,050.00
Net income Dry		**$129,200.00**

Gross Income / yield / price Analysis

Costs fresh - 38%		**Cost dry - 42%**			
Ava - yield (kg/acre) fresh		Price per kg			
kg per plant		$11.50	$13.50	$15.00	$17.00
15	24000	$276,000.00	$324,000.00	$360,000.00	$408,000.00
20	32000	$368,000.00	$432,000.00	$480,000.00	$544,000.00

Note: results will vary with farmer care and resources such as fertilizer.
Note: If harvesting is done from 36-42mths the harvest kg yield will be greater.
Note: Tax and VAGST is not allowed for as the IRS has not designed collection from rural farmers.

Annex 2:

Kava Quality

Why do we need to improve quality through better methods and understanding of the Ava product we intend to export?

Quality requirements governing food production worldwide are being standardized and regulated, we need to comply to enter export markets, our traditional Ava production methods generally do not meet minimum Safe Quality Food production (SQF) standards set.

For Samoa to grow Ava exports we must meet these three objectives:

1. **Quality**, that meets the **importing** countries quality requirements.
2. **Best Noble kavalactone profile** that gives our **customer** the best experience.
3. **Highest kavalactone content** given limitations we face.

If we focus on achieving these main objectives, it is most likely we will grow Ava exports.

There main kava exporting Pacific Islands are, Vanuatu, Fiji, and Tonga let's be guided by what they do to develop good quality Ava exports, and set achievable goals, not only to grow our income for our families, contribute to social obligations and assist Samoa's export earnings.

Vanuatu, Fiji and Tonga's Ava export figures

$22,792,036
(774 tons)

Vanuatu kava exports 2020

$14,568,948
(328 tons)

Fiji kava exports 2019

Fiji exports in 2019 is equivalent to their kava imports from Vanuatu, local production exceeded 1,100 ton and they drank it all.

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Tonga kava exports 2020

Tonga has one quarter the land area of Samoa!

$1,935,960
(223 tons)

Samoa kava exports 1998

(Approximately WST$23.75/kg dry)
This was a record that dropped to 0.2 tons in 2002.

In 2022, the recent Australia Kava as a FOOD import pilot scheme, some 80+ tons of Ava entered Australia, of this total Samoa achieved just 20kg, the potential for improvement is great.

Achieving 200 tons of kava exports should be our first target (Matatia) to do this we need to progressively plant 250-300 acres (480,000 Ava plants/plots) to allow regular annual 200kg of export, local demand will require additional acreage.

Fiji focuses on 2-3 Ava varieties that the market wants, Vanuatu which has many good varieties with different names on different islands, encourage farmers to grow varieties that give the most pleasant effects. They do this because **the market decides** what we must plant if we wish to sell the fruits of our labours.

There are 4046sq meters per Acre, with mono cropping 4046 Ava plants/plots (depending on the rocks) might be possible, for regenerative farming where we plant advantageous trees, ground cover, taro or cocoa with Ava, consider 1,600-2,000 Ava plants/plots per acre, after 3 years generally yield 16-20 ton of fresh Ava or 3.2-4 ton of dried Ava based on 10kg per plot although, in some areas as much as 18-28kg per Ava plot has been achieved at 4 years, only top quality Ava should be exported. Only the stump (rootstock) and roots should be used.

Although the Pacific Islands diaspora, medicinal herbal and pharmaceutical production absorb exported Ava, there is a growing younger group of non-traditional Ava drinkers being introduced to Ava and they are very cognisant of the effects and names of famous Ava varieties, Samoa needs to establish 2-3 top varieties to build a customer base in this new and growing market. America has a growing number of kava bars that are set up with a cafe' style décor capturing a young generation looking for relaxing socialisation without the side effect of alcohol or drugs, we can embrace this growth potential only by providing top quality Ava.

Ava Quality

What is good quality Ava?

1. Noble Ava.
2. Age 3 – 4 years: Research has shown that on average Ava reaches its kavalactone strength at 18 months, from that point on it continues to gain mass and at 3 – 4 years achieves a reasonable yield to time ratio (Time is money), also there is less time for pathogens to damage the crop.
3. No rot or damage from pathogens: Rot contaminates Ava and usually indicates the presence of mold which is toxic.
4. Cleaned properly: Thorough cleaning of roots and stump must be done. All parts of the stump and roots that have been exposed to sunlight must have any green skin removed completely, this is because Ava above ground exposed to sunlight has alkaloids in the skin, these are toxic and must be removed.
5. Below ground stump and roots must be thoroughly cleaned of dirt. Some buyers may require the skin of the stump be removed.
6. Dried properly: It is important to chop Ava for drying such that pieces are small enough so drying is complete, a moisture level of 12% or less is required, test pieces by breaking, if they snap easily, it is dry if they bend it is not dry.
7. Packed properly: The normal packaging used locally is not airtight and therefore has a short shelf life in our climate, for export, an airtight polypropylene bag or other material that is airtight and preferably blocks light, must be used.
8. Stored properly: our tropical climate ambient humidity averages 80% or more and can result in dried Ava absorbing enough moisture to allow mold to develop, mold creates toxins. A good idea used by a farmer in Falealupo is to store properly dried Ava in resealable drums, if the seal is tight, prevents ambient moisture being absorbed, preventing mold.

Kavalactones

Ava plant part	Local name	Description	Kavalactone	Strength	Colour dried
Roots	USO	Called LATERAL ROOTS, dried, high demand export and local	8 - 16%	Very high	Gray - brown
		33 - 65% of harvested weight depending on rocks			
Rhizome	ATA	Called the STUMP or ROOTSTOCK, sometimes peeled	3 - 8 %	Medium	White - light gray
		Chips are dried for export or sold on local market			
		Usually pounded and blended with roots			
		Combination gives a Kavalactone average 8 - 10%			
Rhizome skin	Fisi ga PA'U	Called peelings, Usually done to lighten the colour	7 - 11%	High	Gray - dark brown
		Usually drunk by the Ava pounding team as it is strong			
Basal stem	LALA	First to third node depending on variety	3 - 3.5%	Low	White
		Ava Le'a 3 - 5 nodes, Ava La'au 1 node			

The six major kavalactones & assigned numbers:

Kavalactone	Identifying number
Desmethoxyyangonin	1
Dihydrokavain	2
Yangonin	3
Kavain	4
Dihydromethysticin	5
Methsticin	6

Ava chemotype is determined by the kavalactone profile. There are at least 15 kavalactones which work synergistically to create the effect from different kava varieties, effects such as, encouraging free communication, uplifting, sleepy, relaxing, pain relief, stress relief, anti-mycotic and muscle relaxing. Through 2,000-3,000 years of human selection the varieties that give pleasant effects were replanted, whilst others were not. Vanuatu considered the source of Ava has more than 100 varieties, among these are what are known as

NOBLE VARIETIES that may be exported, the first six kavalactones in a chemotype profile make up 96% of the total kavalactones, with the first three making up to 70%, one can understand why buyers want to know the profile of the first 3 major kavalactones in each Ava variety, once a variety is identified buyers and consumers alike can be confident of a particular desired effect.

Fresh kava rootstock, when prepared by mastication, pounding or grinding, yields a greenish milky solution that is considerably stronger in kavalactone content and taste than the grey/lite brown mixture obtained from dry roots. The reason is, kavalactones are contained within cell walls of the Ava fibre, drying shrinks and collapses the cells making it difficult to rupture cell walls in order to release active kavalactones, thus the need to pound dry Ava into fine particles.

Although commercial production of some kavalactones (Kavain and methysticin) is done, the natural product has greater efficacy due to the synergistic action of all the compounds nature creates in Ava.

Noble Ava must have the first two in the kavalactone profile as 24 or 42, those with 246 and 426 are the most common, enjoyable, daily use Ava, varieties with a high percentage of Kavain (4) and Dihydrokavain (2) create a fast uplifting effect, due to its rapid absorption in the brain (Maximum absorption within 5min), Methysticin (6) has a powerful analgesic effect and is best in position three or four of the sequence, Yangonin (3) and Desmethoxyyangonin (1) are inert compared to Dihydrokavain (2) and Kavain (4), the overall effect of any chemotype is highly dependent on the proportions and total kavalactone profile as all work in concert to produce a given effect.

For the export market we must plant Ava with the best mix of kavalactones 246 and 426 at present these two varieties have been tested and are excellent Noble ava varieties.

1. Ava Le'a – **426351**
2. Ava La'au – **426315**

More testing and identifying of other Noble varieties must be done, Ava Talo SROS testing has given the following kavalactone profiles.

SROS NIRS testing - **Ava Talo**
Noble-426351
Noble-246351
Samoa Not Noble, Vanuatu Noble-423651
Not Noble-463
Not Noble-462

More research is needed to identify conditions that result in a Noble Ava Talo kavalactone profile, or to identify a particular noble variety currently identified as Ava Talo, because the morphology is not unique or distinctive enough to differentiate. It is possible that a group of cultivars identified as Ava Talo have a similar morphology, a shared high-water retention characteristic, whilst having different kavalactone profiles, ie chemotype. Vanuatu pay little attention to Ava morphology as they focus on the effects and enjoyment to determine if replanting is done to perpetuate the type.

High Level of Kavalactone

Not only must the variety chosen for the export market be a Noble Ava variety, it must have a high total kavalactone concentration, 8% or more will attract buyers.

Fortunately, Samoa can meet this provided only roots and stump (rhizome/rootstock) is prepared for export. The following Noble Ava varieties have been tested and good results obtained. We can be confident these will compete favorably, establishing the reputation Samoa needs to build.

1. Ava Le'a – **426351 / 13.40%**
2. Ava La'au – **426315 / 16.69%**

Annex 3:

Kava Economics

Introduction

As a supplier of Ava we must understand our customer, know our costs, determine an acceptable minimum margin price, be aware of the available supply compared to demand, thus we can estimate a possible market price. With this knowledge and keeping in mind long term associations are more valuable than short term gains, it might be best to negotiate a win, win price point with buyers and exporters.

The Farmers Commitment

The vital factor for us as farmers planning and committing to supply Ava for export, is that we grow a variety that meets market requirements, planting has to be continuous to achieve the equivalent number of plants to 4 acres (6,000+ plants/pu'e ava), so that one acre is harvested each year providing excellent regular income, one acre is planted each year, maintaining the cycle, this is just an example, one can make a commitment to plant 100 - 500 ava each year so that after 3 years 100 - 500 are harvested. the difficult period requiring commitment, faith in the future, and hard work is the first 3 - 4 years (Mathew 19:26, Philippians 4:13), careful budgeting each year is necessary.

Who is the customer?

Samoa has a population of 200,000 although more young people are enjoying Ava today, only a small percentage drink Ava (The market is small). On the other hand, the export market is enormous in comparison, therefore we need to understand who the overseas market is that presently buys a total of around 1,300 tons equivalent to USD$42 million = WST$110 million! From Vanuatu, Fiji and Tonga;

1. Pacific Island diaspora
2. Young generation non-traditional Ava drinker
3. Herbal remedy and pharmaceutical producers

We must understand what the market wants, plant the right variety, provide the best quality, control our costs whilst offering a competitive price depending on market conditions of supply and demand. For a historical note Samoa recorded 223 ton of Ava exported in 1998.

What does a buyer want?

The export market demands high quality. Buyers look for the lowest price possible for high quality Ava, they will contact exporters in other countries to gather information on price, quality and quantity. Vanuatu has a well established reputation for good quality, quantity, and stable supply levels, so they generally command a high price. Also Vanuatu have a national regulatory policy and personal who ensure the nation as a whole maintains its reputation for suppling not only good quality but what the customer wants.

Usually buyers preference is for dry Ava roots or roots and stump chips packed separately, occasionally traditionally pounded kava might be stipulated.

Quality: Noble Ava of high quality will be easier to market and command a high price. Ava that is clean, thoroughly dried, with a fresh kava aroma is the minimum quality.

Consistency: Buyers of Ava prefer to establish long-term business relationships with Ava exporters. Not only do buyers want high quality, they want consistently high quality and the quantity agreed to per shipment ie. RELIABILITY/REGULARITY. However, if the quality or quantity is not consistent buyers will find suppliers who are more reliable.

Part of the plant: The roots are higher in kavalactones and command a higher price than the stump chips. International buyers often prefer Ava roots, which they feel are better value and have the kavalactone level they want, although a growing non-traditional market may require a particular Ava variety of pleasant kavalactone profile, strength and powder grade.

Supply and demand: When there an is abundant supply, prices will reduce. Conversely, when supply is low, prices will rise, cyclones, La Nina dry weather and kava dieback disease, have reduced supply at times. Once a relationship is established with a buyer it may be best to settle on a mutually beneficial stable price range rather than create a boom to bust situation, long term relations should be the objective.

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This was a record that dropped to 0.2 tons in 2002.

The foreign exchange earnings support many other sectors in communities, there is opportunity for Samoa to develop Ava exports as part of the Pacific group of Ava exporters.

Export Quality Regulations

An Ava processor aiming to meet buyer nation import quality standards, will be required to have or meet HACCP certification and regular auditing, for this reason processors prefer to do the complete processing in order to ensure Safe Quality Food processing procedures are observed, this will also assure the buyer receive product that can be marketed with confidence. This after all is the objective, the buyer sells, we supply and the circle continues allowing commerce to grow providing us income to fulfil our family obligations and improve Samoa's foreign exchange earnings.

For large farms that comply with export quality and quantity, large investments in Safe Quality Food processing can be done, to achieve higher value added margins.

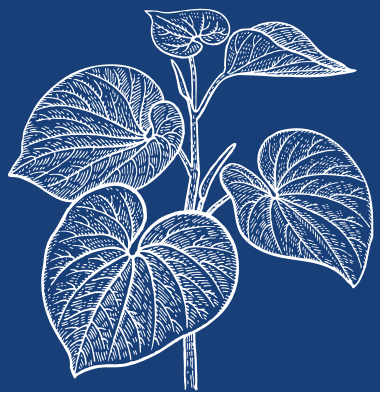
Based on what has been achieved in Vanuatu, Fiji and Tonga, we can enter the market at a competitive market price to begin building a good reputation while achieving good net profits averaged over three years per acre of WST$34-40,000 per annum, harvesting a minimum of 3,200kg dry Ava 3-4 years old.

The vital factor is that we grow a variety that meets market requirements and regulations, planting is continuous so that with 4 acres is planted, one acre is harvested each year providing excellent regular income, the difficult period is the first 3 to 4 years.

Taking a conservative approach, based on known and tested noble Ava varieties, Ava Le'a and Ava La'au, if well cared for and harvested at 3-4 years, with cooperation between many farmers and export processors we will ensure, quality and quantity considerations are met long term. Keep in mind Samoa exported a record 223 ton of Ava in 1998 and now we need to carefully consider how to rebuild exports to achieve a target (Matati'a) of 200 tons.

The basic numbers that are generally applied to Ava are as follows:

1. For multi-cropping or regenerative farming, 1,200-2,000 plants per acre, depending on how rocky and deep the soil is,
2. 10kg fresh harvest per plant is used as the minimum at 3 years, although as much as 24-28kg fresh Ava per plant 4 years old have been achieved,
3. 10kg fresh Ava is equal to 2kg of dry Ava, only roots (Uso) and stump (Ata) are considered for export, some varieties can yield from 10kg - 2.1-2.3kg dry Ava,
4. Harvest is at 2.5-4 years, depending on growing conditions to achieve good yield.
5. Accrued costs for fresh Ava is estimated as 34-38% of gross income, depending on inputs such as fertilizer and chemicals to control pests,
6. Accrued costs for dry Ava is estimated as 40-44% of gross income.
7. Estimated averaged over 3 years WST$34-45,000 per acre, clear profit, based on a conservative minimum yield approach (we have no significant export figures today), it may increase once export market presence is established.
8. Daily labour cost is based on WST$30 not including food or in the case of pounding dried Ava, the Ava consumed during the time it takes to pound, which can be significant.



As many will confirm, a problem today is that many able bodied people are away on the seasonal worker scheme that has now increased to three years for some contracts, this requires a new approach to allow continued growth through specialisation and cooperation, it may prove to be a good situation in respect of export quality. Increasing the quantity of 2 or 3 noble Ava varieties may require some thought, planning and cooperation.

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