Support service for the ACIAR HORT 2019/165 – Enhanced Fruit Systems for Tonga and Samoa (Phase 2): Community-based Citrus Production

SUPPLEMENTARY TRAINING

MOVING ON

ELEMENTS FOR SUSTAINABLE FOOD PROCESSING

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BACKGROUND

Small scale processing of citrus fruits is a formal element of the project as a whole. Previous training has demonstrated that there is significant enthusiasm within the group at Savaii location for sustainable food processing on a small scale. This has served to provide a strategy to reduce waste and provide an alternative to the inconvenient and expensive transport of fresh produce to Upolu. The effect has been small but there is potential to increase the impact through additional processing centres. The highly successful propagation element of this project promises to increase the existing supplies of citrus fruits. Without additional markets however, the oversupply of fruits threatens to increase waste and reduce return for effort for farmers.

This supplement is an introduction to further components that will equip processors to access more markets that are capable of increasing returns with the eventual aim of placement in formal and informal trade at international level.

The factors discussed here will form part of that process and will form the basis for the imminent training scheduled for November and early 2024. They include:

Elements for commercial success including costing.
Packaging.
Labelling.
Processing aids.
The foods we eat and market trends, and
A refresher in clean-down procedures.

ELEMENTS FOR SUSTAINABLE PROCESSING

Introduction

Techniques for preserving local crops are now well established and are suitable and accepted by the local market. However, this project has demonstrated the enormous prospect of a substantial increase in the availability of citrus for on-processing. Few fruit-based products including jams and chutneys are displayed on supermarket shelves in Apia; it is likely that supply of citrus products will exceed demand. Hence there is a compelling imperative to build on achievements so far to transform current features to meet wider markets.

This training supplement will form the basis for further training to address the outstanding strategies to meet the developed markets for competitive display in shops and supermarkets and tourist outlets.

Elements for further discussion will include packaging, labelling, the options for further development of formulations, costing and profitability.

ELEMENTS FOR COMMERCIAL SUCCESS

1 Securing sales – Marketing

1.1 Buying Motive

Successful food producing manufacturers examine carefully the factors that persuade shoppers to choose a certain product. Once the essentials are purchased – probably root crops, milk powder, oil, salt and maybe meat and bread, other non-essential items such as snack foods and ice-cream may be added. This section of the market is where selections are made and they follow after the essential items have been bought. The value-added products already developed here will target that market segment once essentials have been bought.

Factors that affect the decision to purchase non-essential items.

- Cost - family budgets are limited and the current economic environment not only in Samoa, but around the region, means that they are not likely to improve in the near future.
- Cost is not just a price comparison but the feeling that it is value for money.
- When this product is added to the shopping list what has to be eliminated?
- This factor helps to identify the competition.
- Will my family's life improve with this product?
- If not, to what use can it be put?

For the range of products that are now possible with the technology and the experience among the group it now remains to make the products chosen over any similar product. Here are some of the factors that can give our product the advantage.

- Because they are made from crops grown in Savaii does provide a market for local farmers.
- Because they are made in Samoa help to lower the volume and therefore the cost of imports?

- Savaii is a beautiful unspoiled place, and so products are likely to be free from pollution?
- Do chutneys and sauces make dalo, breadfruit, cassava, and plantain more exciting?
- Will the family eat more local crops flavoured with chutney mean that they will be eaten instead of rice and noodles.
- Are banana chips more nutritious than potato crisps?

In the end - if I buy this product will my family be better off?

1.2 Value for money

A significant factor in overcoming the competition is to persuade the consumers that they are getting value for money. As such, price is an important (but not the only) motivator for market purchase. At each stage during the product development process a watchful eye must be kept on the final costs of production and hence the likely final price.

One simple rule of thumb is to multiply the costs of all the raw materials by three. This will give an indication of the production costs to your door. Distribution and profit margins must be added.

Hence accurate costs of all ingredients must be known and the quantities used. This can then be compared to the income received from each product.

THIS IS ONLY A GUIDE BUT WILL INDICATE IF YOU HAVE ANY CHANCE OF COMPETING WITH THE COMPETITION.

AS THE PRODUCT DEVELOPMENT PROCESS ADVANCES THEN MORE ACCURATE COSTINGS WILL BE POSSIBLE

Accurate costing - say - taken over a six month period will give the accurate cost of each product.

2 PACKAGING

Food packaging lies at the very heart of the modern food industry and very few foods are sold unpackaged. Good packaging ensures that the food retains its desired quality throughout its shelf life. Despite its importance and the key role that packaging plays, it is often regarded as, at best, somewhat superfluous, and, at worst, a serious waste of resources and an environmental menace. By the time most consumers come into contact with a package, its job, is usually at an end. However, packaging at a minimum is necessary to ensure that what has been produced reaches the consumer in safe and wholesome condition.

Packaging that can be recycled or re-used is always a preferred option since it produces less pollution and wherever possible the jars used should be retained for as many cycles as possible.

Plastics are however very much part of current life and complete ban is not possible. Coated heavy gauge paper is now in widespread use and current plastic (polypropylene and polyethylene will be phased out as alternatives with the same properties become available. Some manufacturers are using paper to wrap chocolate bars (Mars™ and Snickers™) and

coated paper use is increasing. In the meantime packaging based on plastics are necessary for the packaging to perform its required functions which are:

2.1 Protect Food Products

Foods that have been prepared must be protected from contamination and damage from outside hazards.

- *Water:* Products will absorb water depending on the relative humidity of the surrounding air. Chips will pick up moisture (water) and lose crispness, jam may lose water and become stiff or they may pick up water and support mould growth.

- *Oxygen and light* will cause fatty foods to go rancid giving stale and eventually very unpleasant flavours. If chips are packed in transparent (see through) packaging they should be stored in a second container such as a cardboard box).

  Some foods will change colour if they are not shaded from light. Some darken (jams and chutneys) some will bleach and lose colour.

- *Foreign odours:* Inexpensive plastic packaging may allow different flavours to transfer. Fishiness or garlic are common flavours that transfer.

- *Safety of the food:* The packaging must stop contamination with bacteria, yeasts and moulds and viruses.

- *Consumer expectations:* The shopper must expect the food to be safe and wholesome and packaging must be designed to maintain the food for its expected shelf life.

Estimates of shelf life extension that can be achieved with different packaging options

PRODUCT	PACKAGING	ANTICIPATED SHELF LIFE
FRIED SNACK FOODS	**PE** **50 micron PP** **Laminated PP/PE** **Bi-axially oriented Metallised PP-PE-Paper**	**48 – 72 hours** **18 - 20 days** **6 – 8 weeks** **6-9 months**
CORDIALS	**PET** **LDLPE-paper-LDPE-aluminium-saran LDPE** **ALUMINIUM DEEP DRAW CANS**	**2-3 months** **12 – 15 months** **4-6 weeks** **15 -18 months**
VIRGIN COCONUT OIL	**PET** **GLASS**	**7-12 months** **12-18 months**
NONU	**PET**	**12 – 18 months**

FROZEN POPSICLES (Below -18ºC)	**PE** **PP**	**4- 5 weeks** **8-10 weeks**
FRESH SALADS (UNTREATED) CHILLED)	**THERMOPLASTIC PET** **THERMOPLASTIC PET**	**4 – 5 days** **10 – 14 days**

2.2 Contain

Portion control (profitability): By now the formulation of each product should be formalized in writing. This is essential so that the product can be costed. The packaging will assist in the size of the product and what it contains.

Consistency: The purchaser must be assured that the volume or weight of the product is as stated (see Labelling) and that they are not underweight. At the same time the manufacturer must be certain that they are not 'giving away,' too much product (costs).

Consumer Expectation: Consumers expect that hidden products meet previous experience or what is given on the label. This will ensure repeat sales.

2.3 Inform

Most information is derived from the label but the shape of the packaging will give an indication of its use. Sports drinks are often equipped with a drink nozzle. Some sauces are contained in bottles that have a spout for easy dispensing.

Most of the information is available on the label.

2.4 Attract

Food companies have achieved their success by producing products that are consistent and on which consumers can rely. They have built up a reputation and people who chose that particular brand through brand loyalty. Thus packaging must attract the consumer to choose that product from all those that appear on the shelf. Colours help to do that. Cadbury chocolate packets are blue. Noodles packaging yellow and cheaper brands in white.

3 LABELLING

The label is the most important source of information available for the shopper. It must provide all the information required to enable the consumer to make an informed choice and therefore is an integral part of the concept of value for money.

Detailed Requirements on the Label

3.1 The name of the food.

The name shall indicate the true nature of the food. Where a name has been previously established either through an international standard (Codex) or national law that name shall be used.

There shall appear on the label either in conjunction with or in close proximity to the name of the food sufficient additional information to avoid confusing or misleading the consumer.

3.2 List of Ingredients

In your case: Ingredients: In descending order: Orange juice, lime juice, sugar (maybe water added).

The following foods are known to cause allergy and shall always be declared;

- Cereals containing gluten; ie wheat, rye, barley and oats;
- Shellfish and products of these;
- Eggs and egg products;
- Fish and fish products;
- Peanuts and soybeans and products of these;
- Milk and milk products containing lactose;
- Tree nuts and nut products;
- Eggs and products made using eggs.
- Sulfite in concentrations exceed 10 mg /Kg

Added water shall be declared in the list of ingredients except when the water forms part of an ingredient such as syrup or brine.

It is not mandatory to name individual species or varieties of components. For instance ‘starch,’ can include any starch from any source provided that it has not been chemically modified.

Additive classes can also be found in the same publication so Acids is sufficient to include citric, lactic, fumaric and all remaining generally accepted acids.

3.3 Net Contents and Drained Weights

The net contents must be declared in the metric system and;

- For liquids – a statement of volume in ml or Litres;
- For solids – a statement of weight in g or Kg;

- For viscous or semi-solid foods in g, Kg, ml or Litres.

Foods packed in liquids (brine, syrup, water, vinegar vegetable and fruit juice) must have a statement of drained weight.

3.4 Name and Address

The name and address of the manufacturer, packer, distributor, importer, or vendor shall be declared.

3.5 The Country of Origin

The country of origin shall be declared if its omission would mislead or deceive the consumer and if a food undergoes additional processing in a second country which changes its nature, the second country would be considered to be the country of origin.

In our case, sugar oil and salt are imported. Certain markets (Australia and New Zealand) require that with any such food the label must include 'Prepared from Samoan and Imported Ingredients.'

3.6 General Script

The label script should be written in contrasting colours to the background be approximately parallel to the base. Where the size of the package permits, the lettering should be at least two mm.

3.7 Nutrition Labelling

Not all countries mandate nutritional labels but it is mandatory in countries that are members of the WTO and who have adopted Codex (or a local standard such as Food Standards Australia and New Zealand – FSANZ). (Where standards exist or where nutritional claims are made then the Codex Guide CAC/GL 2 1985 clearly states the items that must appear on the label).

It is not permitted to make unsubstantiated comparisons for example 'Now Contains Even More Fruit.'

3.6 Additional Features

- The optimum storage conditions should be included on the label.
- The optimum storage conditions after opening.
- The expected life after opening in the correct storage conditions
- The use to which the product is intended – this may include a photograph but must be accompanied by the phrase 'Serving Suggestion.'

The label has a role in marketing because consumers are brand loyal (Cadbury's Chocolate: CocaCola etc). In this case the label will be of distinctive colour and logo instantly recognizable.

Wherever possible packaging should be reuseable or recyclable. Unfortunately plastics now play an important role in our society and the long shelf—lives in food required for access to distant markets. It is nevertheless very important that packaging should match the intended shelf life. Paper for instance is satisfactory for street food and for food for immediate consumption.

4 PROCESSING AIDS

Processing aids or additives have become a necessary part of food preparation even used in the domestic kitchen to enhance our home dishes; salt, sugar and spices are added for flavour, turmeric for colour, flour, cornflour and gelatine for texture and egg yolk for emulsifying mayonnaise. All additives improve foods when used ethically.

As we begin to expand our product range then we may start to use additives such as preservatives, and colours and flavours (such as chicken). Over four hundred substances are permitted additives. The products produced so far use several additives including salt, ginger and chili for flavouring and vinegar and lime juice for acidity and sugar and pectin for flavouring and texture.

The full range of additive are:

- **Anti-caking agents** – stop ingredients from becoming lumpy.
- **Antioxidants** – prevent foods from oxidising, or going rancid.
- **Artificial sweeteners** – increase the sweetness without significantly increasing calories.
- **Emulsifiers** – stop fats from clotting together.
- **Food acids** – maintain the right acid level.
- **Colours** – enhance or add colour.
- **Humectants** – keep foods moist.
- **Flavours** – add flavour.
- **Flavour enhancers** – increase the power of a flavour.
- **Foaming agents** – maintain uniform aeration of gases in foods.
- **Mineral salts** – enhance texture and flavour.
- **Preservatives** – stop microbes from multiplying and spoiling the food.
- **Thickeners and vegetable gums** – enhance texture and consistency.
- **Stabilisers and firming agents** – maintain even food dispersion.
- **Flour treatment** – improves baking quality.
- **Glazing agent** – improves appearance and can protect food.
- **Gelling agents** – alter the texture of foods through gel formation.
- **Propellants** – help propel food from a container.
- **Raising agents** – increase the volume of food through the use of gases.
- **Bulking agents** – increase the volume of food without major changes to its available energy.

Are Additives Safe?

Additives are subjects to rigorous tests for toxicity on animals that are used to determine the amount of the additive that is expected to be safe when consumed by humans. This is usually

an amount 100 times less than the maximum daily dose at which 'no observable effects' are produced by an additive consumed over the test animal's lifetime. All testing concludes with carefully monitored tests on human subjects.

After so many tests, the additives are regarded as safe. The greatest risk from food are not the additives but other agents including chemical hazards (insecticides, herbicides, petrol and oil), physical hazards (wood, tobacco, engine parts), and biological (bacteria, yeasts, and moulds).

5 THE FOOD WE CHOOSE

Humans differ from the tree-dwelling apes and our preferences are very different. Meat and fish make up a significant part of todays' island nations' diets. Although an increasing number are choosing to eliminate all animal flesh from their shopping list, most of us stick with regulars – canned tuna, lamb (ha ha) chops, sipi and chicken.

5.1 Meat, fish, savouries and salt

Salt falls into a category of components that we call flavour enhancers (flavour potentiators). This group enhances natural flavour compounds in foods. Small amounts are added to the entire range of our food to boost the flavour – in some cases even in cakes and biscuits. However our use of salt and the part it plays in our cooking may be determined by a number of other factors.

Savoury compounds that are similar to salt are formed during fermentation and are enhanced by the major acid in cheese, and vinegar pickles and sauces. Tomato sauce is common and the group has discovered that chili sauce has wide acceptance.

Our bodies will tell us if we have a nutrient deficiency in other nutrients such as minerals by generating a craving for certain foods (eg chocolate for magnesium, banana for potassium tomatoes for aluminium). Again in some cases these cravings are beyond our own control.

5.2 Sugar and Confections

The enjoyment you feel from eating something sweet is facilitated by the same morphine-like biochemical systems in the brain that are thought to be the basis for all highly-rewarding

In order to maximize our energy intake, our preference for food generally rises with its sweetness intensity. Unfortunately, the well-known conditions of diabetes and obesity are unwanted results that will result from excessive constant sugar intake.

The sweetest un-processed item is honey. It has, in the past, had stellar status. Sadly, sugar extraction has now become relatively inexpensive as sugar is a low cost commodity displacing honey.

5.3 Fat and fried foods

Most of us have preferences for fatty foods – many of which contain highly flavoured chemicals. Foods cooked in fat and oil cook at a very high temperature. The products that are formed during roasting or frying are flavoursome (Amadori compounds, caramels and

Strecker products) and are soluble in fat so remain in the food - unlike boiled during which flavours are washed away. Who doesn't prefer chips and doughnuts to those items cooked in water? To make matters worse they taste much better with a sprinkling of salt! In addition to that, the textures of high fat foods are appealing – either soft and creamy including ice-cream and desserts, or hard and crunchy - crispy chips and French fries.

6 FORMALISED CLEANDOWN

A formalized clean-down procedure is now required.

DAILY CLEAN-DOWN PROCESSING FACTORY

NON-CONTACT SURFACES

Supervisor

Cleaning Agent……Dilution……..Residence time……

DATE																														
FLOORS																														
WALLS/WINDOWS																														
CEILINGS																														
DOORS																														
FAT TRAPS																														
WET WASTE DISPOSAL BINS																														
DRAINS																														
FAN																														
WINDOW SILLS																														
EXPOSED BEAMS																														

FOOD CONTACT SURFACE

Cleaning Agent……Dilution……..Residence time……

DATE																																						
CUTTING TABLE																																							
WEIGHING TABLE																																						
SINKS																																						
STORAGE BINS																																						
UTENSILS																																						
DICER																																						
ROTATING PEELER																																						
FAT TRAPS																																						
WET WASTE DISPOSAL BINS																																						
BLANCHER																																						
DRY WASTE DISPOSAL BAGS																																						
WINDOW SILLS																																						
EXPOSED BEAMS																																						
CHOPPING BOARDS																																						