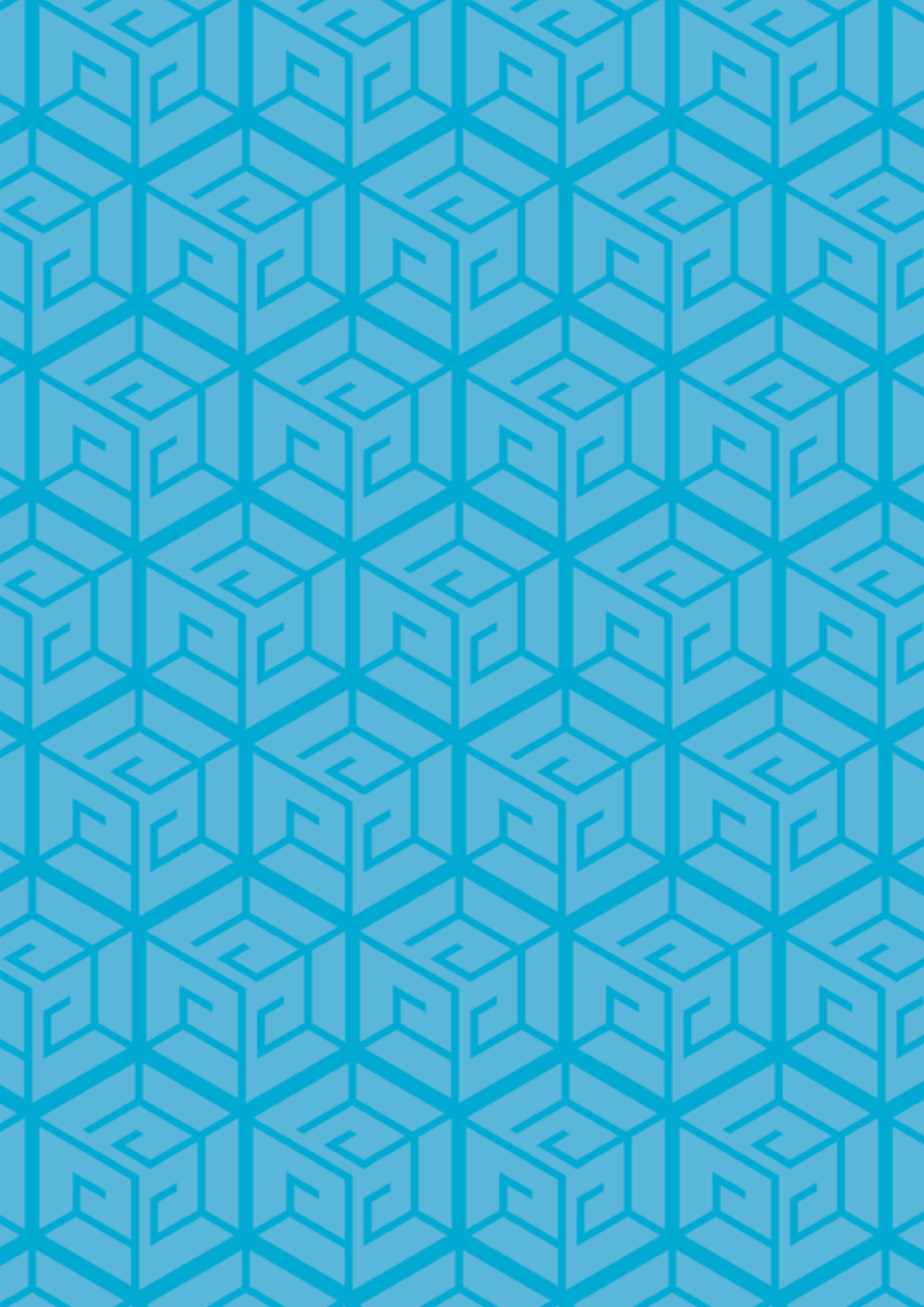


# Identifying Income Generating Opportunities in Root Crops

Preliminary Cost Benefit Analysis of Options for Improving the  
Availability of Locally Produced Root Crops in South Tarawa

JULY 2019





# Acknowledgements

This analysis represents an output from a cost-benefit analysis training conducted in South Tarawa in September 2018.

I am exceptionally grateful to the Ministry of Environment, Lands and Agriculture Development's (MELAD) staff, in particular Beraina, Susana, Kiritian and Iuta for their commitment to completing the analysis and hope that they will find the techniques learnt valuable in their future work.

Kam rabwa to the traders and retailers that participated in the value chain analysis – both at the workshop conducted by MELAD and those that were interviewed subsequently.

I am indebted to Richard Beyer and SPC for sharing his insights and feasibility assessments for an agro-processing facility on Buitaritari which fed into the analysis.

This analysis would not have been completed without the fantastic support of Norma Rivera from the Global Green Growth Institute in Kiribati for her unwavering commitment to facilitate all the logistical arrangements, her patience and her technical input to the study.

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Cover Photo: Babai Pit, Abaiang. Photo Credit: © Norma M. Rivera

# Acronyms

<b>AusAID</b>	Australian Aid Program
<b>A\$</b>	Australian Dollar
<b>BCR</b>	Benefit-cost ratio
<b>CBA</b>	Cost benefit analysis
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>GGGI</b>	Global Green Growth Institute
<b>GoK</b>	Government of Kiribati
<b>KSSL</b>	Kiribati Shipping Services Limited
<b>KV20</b>	Kiribati 20 Year Vision
<b>MCIC</b>	Ministry of Commerce, Industry and Cooperatives
<b>MELAD</b>	Ministry of Environment, Land and Agricultural Development
<b>MHMS</b>	Ministry of Health and Medical Services
<b>MFED</b>	Ministry of Finance and Economic Development
<b>OB</b>	Office of the President
<b>NPV</b>	Net Present Value
<b>SPC</b>	Secretariat of the Pacific Community

# Contents

<b>Executive Summary</b>	<b>1</b>
<b>1. Introduction</b>	<b>3</b>
<b>2. Background</b>	<b>5</b>
<b>3. Methodology and Options Considered</b>	<b>10</b>
<b>4. Limitations</b>	<b>16</b>
<b>5. Preliminary Results and Sensitivity Analysis</b>	<b>20</b>
<b>6. Discussion</b>	<b>22</b>
<b>7. Recommendations</b>	<b>24</b>
<b>References</b>	<b>26</b>
<b>Annexes</b>	<b>27</b>
Annex 1: Value Chain Mapping Analysis: Pumpkins from Buitaritari - Tarawa	27
Annex 2: Stakeholder Consultation List	34



# Executive Summary

Cost benefit analysis (CBA) can be used as a decision-support tool to assess the benefits of investing public funds in different options designed to stimulate economic activity and livelihood creation.

The Government of Kiribati (GoK) requested support from GGGI to conduct a Cost Benefit Analysis (CBA) training for local government officials as a tool for assessing green and climate resilient development projects to support livelihood development. Following the training one of the CBAs planned during the workshop was completed to demonstrate the use of the tool. Staff from the Ministry of Environment, Land and Agricultural Development (MELAD) designed the analysis and participated fully in the collection of data, development of assumptions and completion of the analysis.

This preliminary analysis documents the results of a CBA that assessed the following options: investing in a central market in South Tarawa, investing in solar-freezers on outer islands to promote trade in frozen products, and investing in small agro-processing facilities to promote the development of value-added products.

The preliminary analysis concluded that all options considered are potentially viable under certain assumptions (see Section 5). Further data is needed – relating to maintenance and running costs of the various investments, the feasibility of transporting frozen goods and additional interviews to inform the estimates of the size of the market - to improve the robustness of the results.

To realise the livelihood benefits of the various options, any further development of this options should be done with the full participation of all existing actors in the value chain (farmers, traders, agricultural extension officers, transport providers) to ensure that investments are suited to their needs.

The following recommendations resulted from the analysis:

## Invest Small and Learn by Doing

Investing in small-scale agro-processing with appropriate training and business support services provided to producers and traders should proceed and represents a low risk option for government investment. Larger investments are possible once the viability of small-scale investments has been demonstrated<sup>1</sup>.

While a new market facility has benefits, further examination of lower cost options for improving and expanding existing roadside market facilities – as distinct from constructing a new market facility – should also be explored. The existing market for pumpkins has developed without significant investment in infrastructure and could be replicated for sweet potato.

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<sup>1</sup> In this case, a micro investment is below A\$ 5,000; small investments equal A\$5-100k; medium investments equal A\$100,000-A\$500,000 and large investments are above 500k+

## Support Existing Value Chains and Private Sector Actors

It is important that MELAD and MCIC work jointly to support existing value chains and private sector actors and ensure that work to stimulate additional production does not undermine existing value chains.

It is also clear that existing value chains have constraints that could be addressed. For example, wastage in the existing pumpkin value chain is high (approximately 20%) and working with producers and traders to identify options to improve post-harvest handling could result in additional supply. Producers also reported pest and disease issues that could be addressed by MELAD extension services.

To ensure local and affordable food is available for consumers in South Tarawa it is critical that existing value chain actors are supported to strengthen the current fragile value chains.

Value chain analysis can be a useful tool in helping to identify specific constraints and needs. Training in value chain analysis should be conducted so that MELAD and MCIC staff are able to conduct this for all commodities they are working on.

## Demonstrate Viability of the Market for New Products

MELAD and MCIC have an important role in helping to stimulate as yet untested products and market opportunities and to give traders and other private sector actors confidence to enter the market. Part of this role can simply be to connect existing actors to each other.

The MELAD trials for root crops should continue to determine the viability of the market in terms of taste, quality and price preferences.

Working with existing traders to do this would help to stimulate their interest in the market. For example, MELAD ideally should not be selling any produce itself but simply facilitating others to do so as part of the trials.

## Improve Availability of Data to Support Analysis

This study was constrained by the limited information available for domestic production and trade of agricultural goods. Investing in improving data availability to support informed decision making is critical for value chain and/or cost benefit analysis to be conducted regularly.

# 1. Introduction

This report outlines the results of a preliminary cost benefit analysis (CBA) in partnership with the Government of Kiribati as part of Global Green Growth Institute's (GGGI) work in Kiribati. The analysis was completed to demonstrate the application of the CBA framework and to support decision making relating to various agricultural initiatives to support agriculture and green job development currently under consideration.

GGGI is an international, inter-governmental organisation working to promote a resilient world of strong, inclusive, and sustainable growth (GGGI, 2018) targeting key aspects of economic performance such as poverty reduction, job creation, social inclusion, and environmental sustainability. In delivering country programmes, it works across the thematic priorities of sustainable energy, green cities, sustainable landscapes, and water & sanitation.

Kiribati is a founding member of GGGI and deposited its Instrument of Ratification in 2012. The focus of GGGI's activities is to support the GoK identify and support micro income generation opportunities, improve availability and access to green infrastructure services for the achievement of development objectives and share knowledge on integrated planning approaches for climate change adaptation and green growth (GGGI, 2018). GGGI's Kiribati Country Planning Framework will be completed in 2019.

The GoK requested support from GGGI to conduct a Cost Benefit Analysis (CBA) training for local government officials as a tool for assessing green and climate resilient development projects to support livelihood development. Following the training one of the CBAs planned during the workshop was completed to demonstrate the use of the tool applied to a specific project.

CBA training was conducted in September 2018 for officers of the Ministry of Environment, Land and Agricultural Development (MELAD), the Ministry of Finance and Economic Development (MFED), and the Office of the President (OB).

The training was aligned to GGGI's focus area in Kiribati to strengthen integrated planning approaches, the evaluation of green and climate-resilient projects and the identification and assessment of sustainable micro-scale income generation opportunities. It included practical exercises and participants planned a CBA within their own work areas.

Officials from MELAD identified the issue of a lack of affordable and reliable local agricultural produce for consumers in South Tarawa – and the resulting health problems arising from a reliance on processed, imported rice – as a problem that they wished to analyse in more detail. They identified high levels of wastage due to poor post-harvest handling and transport services, limited shelf life of produce, lack of facilities to market produce and limited opportunities to value-add at source as key problems within the current value chains.



The solutions to these constraints can provide an opportunity to create green jobs and livelihood opportunities to people in the outer islands while providing locally produced food to the capital of South Tarawa. The MELAD team identified three options for potential investment projects:

1. Investment to construct a central market for producers and traders to bring produce from the outer islands to retail in South Tarawa
2. Investment in solar freezer storage on nearby outer islands and in South Tarawa to allow root crop producers and traders to supply frozen root crops to South Tarawa
3. Investment in small scale agro-processing on Buitaritari to produce higher value, processed products with a longer shelf-life at source.

Following the workshop, officials from MELAD gathered data required to complete the analysis. Data availability constrained the level of detail at which the analysis could be conducted.

The analysis was conducted as a learning exercise and makes several assumptions based on expert opinion (as described below) to simplify the analysis or account for the lack of data. The process of gathering the necessary information to complete the analysis generated useful discussions (see Sections 4 and 5) about the appropriate way to stimulate agricultural production in Kiribati that can feed into wider policy discussions.

Photo 1: One of the largest market in South Tarawa, the market in Bikenibeu is surrounded by other smaller stalls.



## 2. Background

The Republic of Kiribati is an island nation in the Central Pacific, consisting of 33 atolls and reef islands and one raised coral island, Banaba. Kiribati's islands have a total land mass of 726 km<sup>2</sup> and are spread over 3.5 million km<sup>2</sup> of ocean. (Ministry of Health, 2017). Like many Small Island Developing States, Kiribati is highly vulnerable to climate change and affected by its impacts including rising sea levels, increasingly frequent and severe storms, permanent erosion of the shoreline, frequent seawater inundation on fresh water resources, and reduced food security. The country also faces a number of structural economic challenges given its remoteness, small market size and limited institutional capacity (GGGI, 2018).

The economy of Kiribati is based on agriculture, development assistance fisheries, fishing licences, and remittances. Due to lack of natural resources in atoll environments, for the people living on the outer islands, opportunities are largely limited to agriculture and fisheries, tourism. Creating additional livelihood opportunities could potentially reduce migration from the outer islands and release pressure on the capital, where 50% of the country's population currently resides.

Unemployment is particularly a problem for women and young people. Women's unemployment rate is 47% (MWYSA, 2019); in 2010, 54% of youth were unemployed (MFED, 2016)<sup>2</sup>. Many young people are also underemployed, particularly on outer islands. Poor soils and limited freshwater availability constrain agricultural opportunities, but the sector does make a significant contribution to domestic

food security and provides some income generating opportunities.

The private sector is relatively small but its contribution to GDP has increased from 47.3% in 2005 to 54.5% in 2015 (KV20). Business registration records highlight that most registered businesses are located in South Tarawa (1892) and Kiritimati (232). The other 19 islands, for which data is recorded, have less than 100 registered businesses each (KV20, based on MCIC business registration records in 2017).

The Kiribati Vision 20 (KV20), Kiribati's "... long-term development blueprint for the period 2016-2036.", (OB, 2017) focuses on the development of two main industries, fisheries and tourism. New initiatives to support the KV20 will focus on providing support to fisheries and tourism. On the agriculture side, the document states that there is "...weak and/or absence of essential infrastructure and supporting mechanisms to facilitate large scale production for domestic trade". This CBA is one step towards identifying these constraints and opportunities in agriculture development that can increase domestic trade and create livelihood opportunities. In conducting this CBA, GGGI also supports Key Priority Area 2: Economic Growth and Poverty Reduction and Key Priority Area 4: Environment of the Kiribati Development Plan (KDP 2016-2020).

GGGI's support to Kiribati aims to strengthen and green the private sector, including small scale business, increase food security with integrated and sector-specific approaches and promoting healthy and resilient ecosystems.

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<sup>2</sup> <http://www.mfed.gov.ki/sites/default/files/Economic%20Outlook%20April%202016.pdf>

<sup>3</sup> According to the 2015 Population and Housing Census, the population of South Tarawa is 56,388; the population of Kiritimati, Kiribati's second urban center, is 6,456. The population of Kiribati's

other 20 inhabited islands range from Aore with 268 inhabitants to North Tarawa with 6,629 inhabitants. The tourism sector in the country is concentrated in South Tarawa and Kiritimati, where international airports and seaports are located. (OB, 2017)

Farmers in remote atolls face various inherent challenges - land availability, poor soil conditions, pest and diseases, high cost of inputs, and a lack of market; however, in Kiribati, there are several islands capable of producing larger quantities of fruits and vegetables such as root crops:

1. Buitaritari
2. Makin
3. Marakei

Domestic markets on these islands are small, given the size of their population. To sustain small agricultural businesses, producers and traders transport produce to South Tarawa or Kiritimati, where the population is larger<sup>3</sup> and availability of fresh produce is lower.

Despite the apparent opportunities available to outer island producers to expand their production and increase their supply to South Tarawa, their ability to capitalise on these opportunities is hampered by various infrastructure constraints along the value chain. These include a lack of dedicated cargo space for fresh produce in transportation vessels, lack of cold storage on vessels and in markets, and low general knowledge about post-harvest handling practices. These constraints result in losses at each stage of the value chain and reduce the confidence of farmers and traders to reliably supply the market and generate suitable returns on the time and resources invested.

Inter-island trade is dominated by imported products, such as sugar, flour and rice, and while the GoK has implemented various initiatives<sup>4</sup> to boost the volume of local produce and products traded, there remains an undersupply of affordable and nutritious local foods available on Tarawa (pers. comm MELAD).

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<sup>4</sup> For example, all traders of agricultural produce from the outer islands to Tarawa can claim back the cost of their freight from the Ministry of Finance through a freight subsidy. \$1m a year is allocation to this scheme <https://kiribatinews.co.nz/2018/11/29/2019-budget-speech-by-kiribati-minister-of-finance/>

Domestic trade is constrained by limited primary production, limited supply infrastructure including shipping, poor producer – market links and limited cold storage facilities that can extend the shelf life of agricultural products for which there is demand on South Tarawa.

## The Problem - Existing Constraints

South Tarawa relies heavily on imported food – particularly carbohydrates (rice, flour, and potato fries) and frozen vegetables. This reliance, coupled with limited availability of locally grown fresh produce, has contributed to poor diets. Thus, there are negative implications for the health of the nation where life expectancy is estimated at 61.7 years for males and 72.1 years for females (2017, Annual Health Bulletin).

Diabetes and heart attacks rank number one and two as the leading causes of death (2017, Annual Health Bulletin) placing significant costs on government infrastructure, services and society.

MELAD staff have identified the lack of a central market and inadequate cold storage facilities both in Tarawa, on nearby outer islands and on shipping vessels as some of the constraints to the expansion of production and trade from nearby outer islands such as Buitaritari, Makin and Marakei. These islands have land and labour availability to grow and supply more produce to South Tarawa if viable business opportunities were available (pers. comm MELAD).

Currently, most outer island produce<sup>5</sup> is sold at small roadside stalls across Betio and South Tarawa. Bananas and pumpkins are the main crops coming in from the outer islands (FAO, 2011).

<sup>5</sup> Produce originating from the outer islands includes: babai, banana, breadfruit, cassava, fresh coconut, fig, pawpaw, pumpkin and sweet potato; these originate from the islands of Buitaritari, North Tarawa, Makin, and Marakei (pers. comm MELAD).

MELAD staff believe that the lack of a central market results in traders having additional transaction costs (largely transportation and time) that discourages them from bringing produce from the outer islands to sell in South Tarawa. Further analysis and focus group discussions with traders are required to validate this assumption.

A significant issue to address is that of wastage on domestic shipping vessels, the primary cause of post-harvest loss. This could be reduced by improving post-harvest handling and using crates and/ or boxes to transport produce. These are specific post-harvest storage containers are not used widely and produce is rarely cleaned before shipping. Pumpkin traders shared that average wastage of total volume produced is around 20% due to poor transport conditions. This wastage must be factored in to current pricing as fresh produce remains relatively expensive and beyond the means of many South Tarawa residents.

This analysis does not consider specific investments in improved post-harvest handling and transportation options but given the large proportion of spoiled produce, supporting traders to examine options to reduce this should be facilitated by MELAD staff in partnership with existing traders.

Retailers in Tarawa currently stock frozen taro and cassava from Fiji. In order for local traders to be able to trade frozen root crops, freezer storage facilities would be needed at packing facilities and on shipping vessels. This could extend the shelf life of root crops (sweet potato, babai and cassava) traded from the current few days to a few months, but at significant additional cost. MELAD staff have been trialling the shipment (via air freight and shipping) of frozen root crops from nearby outer islands to South Tarawa to test their acceptability in the market.

Retailers seemed unwilling to take risks on stocking new produce (pers. comm MOEL Trading) but would stock the produce provided the consistency and reliability of the value chain had been demonstrated.

The constraints in regularly supplying the main urban centres in South Tarawa, highlighted above, reduce the incentives for farmers to transition from subsistence to semi-commercial agriculture.

To better understand the possible livelihood opportunities that could be created from an expansion of infrastructure to support value chains for various root crops supplied to South Tarawa from the outer island, the current value chain for pumpkins was analysed to identify the main actors involved and opportunities that might be available for other fresh products. This value chain functions well with several farmers and traders supplying wholesalers, retailers and restaurants in Tarawa. A 2011 study by FAO estimated the weekly market size for pumpkins at around 900kg/week. For the purposes of this study the main traders were interviewed and the estimated market size for pumpkins has increased to approximately 2000kg per week<sup>6</sup>. The hospital is a major consumer of local produce. The value chain for pumpkins was evaluated (see Annex 1) to better understand the distribution of benefits across the chain and to ensure that assumptions on the possible size of the market for other local crops were realistic.

The value chain analysis for pumpkins highlights that pumpkin producers / farmers enjoy a relatively large share of the total proportion of the sales price for pumpkins in South Tarawa (approximately 45%). This supports the hypothesis that improving the infrastructure and business environment were to support additional agricultural value chain development would have significant benefits for producers.

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<sup>6</sup> Estimated from discussions with current traders but a more comprehensive market assessment is suggested as a pre-requisite for completing the analysis

## Trials of Domestic Root Crop Trade

MELAD recently trialled facilitating the trade of sweet potato, babai and cassava on four separate consignments to South Tarawa between May and November 2018 to test market acceptability.

MELAD extension services worked with the Island Councils to act as a collective marketing organisation. The Island Council purchased the products from the farmers (at A\$2.30/kg) and the GoK purchased the produce from the Island Council (at A\$3/kg), covered the costs of the transport and sold the produce in South Tarawa, with no additional mark-up. In May 2018 the consignment was vacuum packed and frozen. Subsequent consignments were sold fresh.

The prices paid to farmers and the Island Council are therefore artificially inflated given that they do not incorporate labour (provided by Ministry extension officers) and transport (paid by MELAD) and are unlikely to be viable for a trader entering the market. Caution should be taken that in attempting to stimulate a new market to ensure it is not being undermined before it is established. It is difficult to lower expectations and pay

lower prices to producers once a precedent has been set. Taking producers through the value chain and the costs that a private trader would have to cover is a useful exercise that MELAD staff could conduct with producers on these islands.

## Results of the Trial

Produce was provided to various retailers to taste and ascertain acceptance (taste, quality) for the produce and to seek feedback.

Feedback from consumers following the trial indicated general acceptance of the frozen and fresh sweet potato.

Feedback for the babai was generally that it was bland and tasteless when cooked from frozen. The babai was first tested as frozen upon harvest and subsequently cooked ahead of being frozen. Initial trials provided feedback that it was better when frozen after cooking.

Feedback provided on the cassava was that it was quite bitter.

Selling prices for the trialled products on the trial are given below.

- Cassava / Sweet potato - A\$3/kg
- Babai A\$5/kg

Photo 2: Sweet Potato & Cassava. Shipment from the outer islands as part of the domestic root crop trade trial.





## Agro-Processing Opportunities

In addition to looking to increase the trade in fresh produce, another option for creating livelihood opportunities in the agriculture sector is by extending the shelf-life of produce from the outer islands. This can be done by facilitating small scale agro-processing of crops into a variety of value-added products for which there is

identified demand in the South Tarawa market.

A recent feasibility study conducted for Buitaritari identified several feasible options for small scale processing of root crops, bananas, pumpkins, coconuts and pawpaw to produce chips and jams. (Beyer, 2018)

Photo 3: Pumpkins sold on small market in Nowerewere. Nowerewere, South Tarawa.





# 3. Methodology and Options Considered

In order to assess the various options identified by MELAD staff as described above, a preliminary cost-benefit analysis of the options below was conducted.

The following section provides a description of each of the options considered as part of the analysis.

## Option 1: Constructing a Central Market in South Tarawa

This option involves the construction of a purpose-built facility with improved facilities (bathrooms, water) in a central location (to be determined) that could cater for the needs of traders bringing produce to market and market vendors in South Tarawa. It assumes that a central facility would enable traders to focus on bringing produce to South Tarawa and provide them with increased confidence to do so. It would provide a central hub for buyers to purchase a reliable supply of locally grown produce stimulating demand – and encourage producers and traders to work collectively to increase supply.

Municipal markets have been demonstrated to have positive effects on the local economy, but care must be taken to ensure assumptions relating to increased economic activity (rather than displacement of existing economic activity) are valid.

In an FAO study conducted in Fiji on the feasibility of establishing collection centres, the opportunity to use them as a networking

space and to strengthen relationships between buyers and sellers was identified as the prime motivating factor among farmers and traders for their creation over and above any immediate cost savings (FAO, 2009). Ensuring that the space acts as a social space that can connect traders and consumers should be a prime consideration in the design of the space. This has implications for example for its location and the facilities included.

For a central market to stimulate additional demand, buyers would need to prefer to travel to the market, perhaps incurring additional expenditure, to buy their produce. This may occur if there is greater range of produce available, prices are lower, and/or they can combine their vegetable shopping with other activities. It is not clear that this assumption holds however, and a market survey is recommended with consumers to ascertain their shopping preferences as part of furthering the analysis of this option.

Three possible locations for a central market discussed during the development of this CBA were Bairiki, Bikenibeu and Betio. South Tarawa's population of over 56,000 people (GoK, Population Census 2015) are dispersed across the length of the atoll. While Bairiki represents a business center of sorts it is not particularly close to major population centers such as Betio and Bikenibeu. Betio accounts for 12% of land on the atoll and its population corresponds to 30% of the population of South Tarawa. Bikenibeu, having a smaller population density than Betio already has a small market next to the high-school and a second smaller market in the nearby village of Nowerewere.

Building a central market in Betio would mean that 30% of the population would have access to agriculture products within walking distance of their residence. This could potentially create a relatively steady demand of these products and increase trader confidence, thus strengthening the value chain.

It is unlikely that a central market established in any other location would stimulate additional local production of existing and new agriculture produce. Currently, most consumers shop for fresh produce at roadside stalls.

Markets in South Tarawa generally have qualities of an oligopoly (few buyers and sellers) and are dominated by a few large traders and producers. As such it is unlikely that additional demand will lower prices unless it also creates opportunities for new traders to enter the market. This may occur if the market place facilitates connections between existing and new traders and vendors. MELAD and MCIC should consider including business training for interested traders as part of any market construction. Transport costs in South Tarawa do not represent a significant cost to traders (see Annex 1) and resulting savings would therefore be small.

Municipal markets are generally operated by local government and the local council would need to be consulted on their willingness to assume responsibility for the management and the maintenance of the facility. The Ministry of Commerce, Industry and Cooperatives (MCIC) has plans to construct a market in Betio (pers. comm MELAD) and coordination with any projects led by MCIC is critical to avoid duplication.

For the purposes of the analysis, the costs of a recently constructed integrated fish and handicraft market in Bairiki that includes a small restaurant and washroom facilities have been used as the basis of the costs in the analysis (A\$300,000).

Given the uncertainty related to the possible benefits of increased production and sales, the analysis provides information on the additional volumes that would be necessary to make the investment viable.

## Option 2: Installation of Solar Freezers on 3 Outer Islands (Buitaritari, Makin and Marakei) and in South Tarawa to Enable Trade of Local Frozen Root Crops (Sweet Potato, Babai, Cassava)

Frozen imported taro and cassava from Fiji is widely available in South Tarawa and retails at A\$4.50 and A\$3.80 respectively<sup>7</sup>.

One trader (importer and retailer) shared that they are selling over 1000kg of frozen taro and cassava per month. Sales peak around the fortnightly pay day of civil servants and the products are generally used for special occasions as they are too expensive to be consumed on a regular basis.

Sweet potato, babai and cassava can be grown locally and could potentially be supplied at competitive rates to imported produce if appropriate infrastructure were available.

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<sup>7</sup> At Punjas, Betio (Dec, 2018)

Stimulating competition for these imported products would require investment in freezers on the outer islands and in South Tarawa. It would also require being able to transport the products frozen either through a partnership arrangement with Kiribati Shipping Services Limited (KSSL), a state-owned enterprise, or through investment in freezer capacity on the island vessels.

Retailers shared their general unwillingness to stock fresh produce as it can attract vermin (rats and mice) that can damage their other products.

Farmers, producers and traders would need additional training and advice on effective and climate resilient methods for growing sweet potato and cassava as well as cleaning, packing, post-harvest handling, and preservation techniques.

Awareness sessions conducted by MELAD staff (pers.comm, local trader) about potential options to supply pumpkins to South Tarawa have helped to stimulate the value chain in pumpkins from relatively small volumes in 2008 to an estimated 2000kg/week in 2018. The Tungaru Central Hospital, a public hospital also acts as a major consumer of pumpkins. This regular, reliable demand may have given traders confidence to increase the volume of pumpkins purchased from farmers.

In looking to replicate this success it is important to recognise the relatively restricted role played by MELAD in providing training and advice. Working within the boundary of providing training and advice was a successful approach as the objective (to improve the value chain for pumpkins) was achieved. It is critical for long term sustainability that MELAD staff continue to facilitate but **do not substitute**

the role of traders in the value chain. Recognising the potential role of public institutions (schools, hospitals, prisons) as consumers and their ability to purchase in bulk can provide a key way to provide market certainty to traders. MELAD are encouraged to work further with potential private and public consumers to complete a more accurate market assessment.

### Option 3: The Establishment of Small Agro-Processing Facilities on Buitaritari to Develop Locally Produced Value-Added Products such as Chips and Jams

To overcome some of the constraints to supplying fresh produce (limited shelf-life, high levels of wastage, inconsistent and unreliable transportation), small-scale agro-processing has been recommended as a viable income generation opportunity for farmers on islands with enough excess production of locally available crops.

A production facility built in Temaiku in 2008 failed to stimulate local production opportunities as the equipment was designed for a greater volume of raw materials than could realistically be supplied. The general constraints to supplying fresh produce to the South Tarawa market also hampered its operations as a large proportion of the produce was spoiled by the time it reached South Tarawa (Beyer, 2018).

A feasibility assessment conducted by the South Pacific Community (SPC) (Beyer, 2018) examined the investment required for machinery necessary to establish a small-scale processing facility capable of producing chips (banana, breadfruit, pumpkin), jams (coconut, pawpaw, pumpkin), chutneys and vinegar.

This has been included in the analysis as an additional option for stimulating local consumption and production.

The options are not mutually exclusive and could be implemented simultaneously. They are assessed as three options for the purposes of the analysis.



Photo 4: Fish sales area.  
Bairiki Integrated Fish Market.



Photo 5: Local Handicraft sales area and  
ice plant. Bairiki Integrated Fish Market.

**Table 1: Description of Options Considered**

	Without Project	Option 1	Option 2	Option 3
<b>Description and Key Assumptions</b>	Current supply levels of produce from outer islands to South Tarawa continue	New market in South Tarawa stimulates production and increases supply of produce from outer islands to South Tarawa	Availability of solar freezers stimulates production and increases supply of frozen produce from outer islands to South Tarawa	New agro-processing facility stimulates new entrepreneurs to develop new products for supply to Tarawa
<b>Costs</b>		Construction, management (including labour) and maintenance costs of new market	Purchase, freight, installation, management and maintenance of solar freezers on Buitaritari, Makin, Marakei and South Tarawa	Purchase, management and maintenance of small agro-processing facility at the Buitaritari ice plant
<b>Benefits</b>		Additional volumes of goods produced and sold by farmers on outer islands	Additional volumes of goods produced and sold by farmers on outer islands	New entrepreneurial activity stimulated, and self-employment opportunities created
		Additional income generated by traders involved in the value chain	Additional income generated by traders involved in the value chain	Additional income generated by traders involved in the value chain
		Displacement of imported food with more nutritious local produce	Displacement of imported food with more nutritious local produce	Displacement of imported food with more nutritious local produce
		New traders encouraged to start operations	New traders encouraged to start operations	Reduced wastage of partly-spoiled crops – converted to a processed product
		Existing traders given certainty to allow them to expand their operations	Existing traders given certainty to allow them to expand their operations to new products	New products (chips, jams, etc.) available in South Tarawa
		Additional economic activity generated by small businesses in the vicinity of the market (restaurants, shops etc)		
		Reduction in imports due to increased consumption of local foods by South Tarawa residents (retention of income within the local economy)	Reduction in imports due to increased consumption of local foods by South Tarawa residents (retention of income within the local economy)	Reduction in imports due to increased consumption of local foods by South Tarawa residents (retention of income within the local economy)



In the absence of a Government recommended discount rate, a discount rate of 7% was used across all options. Sensitivity analysis at 4% and 10% was conducted to test the robustness of the results to the real discount rate<sup>8</sup>.

## Livelihood Considerations of the Various Options

Each of the options considered above has different implications for the stimulation of livelihood opportunities for farmers on the outer islands. The assumption for all options is that the stimulation of opportunities for traders and agribusinesses will create markets for producers. Similar to the existing value chain for pumpkins, which has stimulated opportunities for pumpkin farmers that supply traders, the opportunities for root crop traders should lead to opportunities for root crop producers. Within the pumpkin value chain one trader, who is also a farmer, is now buying from up to 15 additional farmers to supply their market on South Tarawa.

Option 3, on the establishment of agro-processing facilities is likely to lead to greater opportunities for women. Women in Kiribati hold a higher share of childcare and household responsibilities (MWYSA, 2019). Women's unemployment in Kiribati is 47% compared to 36% for men (MWYSA, 2019). Agro-processing, which can be done close to home, can provide an opportunity for women to enter the job market while still being able to juggle some of their existing responsibilities with small-scale income generating opportunities.

Considering the high levels of unemployment for women and youth, targeting these groups could provide additional livelihood options specifically for these vulnerable groups. To do so, it will be important to target these groups for trainings on agricultural value chains, production techniques and agro-processing, and other related trainings.

It is vital that training for all target groups be done in partnership with existing and potential traders that have networks to markets in South Tarawa. Trader's inputs on the development of infrastructure options should also be sought out as they well suited to provide guidance on what best suits to their needs.

Photo 6: Private Garden, Abaiang, Gilbert Group.



<sup>8</sup> These rates have been used in several SPC analyses and are recommended in Buncle et al (2016), Cost benefit analysis for

natural resource management in the Pacific. The World Bank generally uses higher discount rates of around 10%.



## 4. Limitations

The options considered as part of the analysis rely heavily on expert opinion and assumptions as detailed below. The analysis should therefore be considered preliminary and can be added to as more data becomes available.

### Market Sizing

Estimating the size of a hypothetical market (for additional agricultural produce or frozen root crops) is not straightforward giving the absence of consumer surveys or market assessments on which to base assumptions. This analysis has had to rely on the existing market data for pumpkins (as an example of a local produce market that has grown over the least ten years) and imported taro and cassava (as an example of existing demand for frozen root crops) to make general assumptions about the possible size of the local market for all root crops. In order to better understand the likely magnitude of trade to assess constraints to stimulating livelihood opportunities for farmers, the analysis of the value chain for pumpkins guided assumptions made for the possible size of the market for root crops. For example, if the current market size for pumpkins is an estimated 2000kg/week it is unlikely that the market for other crops would be greater than this and in their early years of production would be considerably lower as the market developed. These assumptions have been tested as part of the sensitivity analysis presented below.

Using the existing market estimate for pumpkins (2000kg/week) it is assumed that a local market of an additional 60kg a week of additional produce (of any type) in Year 1 rising at 3% per annum to 1500kg/ week in Year 19 could be supported. South Tarawa's population increased by a very high annual growth rate of 4.4% between 2005 and 2010. (KNSO, Kiribati Census); therefore, an estimated growth of 3% per annum is feasible.

Using the existing market estimate for imported taro and cassava of 2000kg/month it is assumed that an initial market in Year 1 of 150kg/week for sweet potato and cassava and 100kg/week for babai could exist growing at 5% a year to 380kg/week for sweet potato and cassava and 250kg/week of babai by Year 19.

It is assumed that as customers are already familiar with these products that growing the market by a slightly higher 5% a year would be possible based on sales prices that are lower than imported goods.

Cost benefit analysis often suffers from optimism bias (i.e. project proponents present optimistic rather than realistic estimates of the future). A conservative estimate of potential market size and growth has therefore been assumed. This assumption should be validated by experts familiar with the agriculture sector in Kiribati.

**Table 1: Key Assumptions Used in Estimating the Size of the Market**

Parameter	Assumption	Further Data Required
Current Production of Pumpkins	2000kg/week	Further analysis required to validate – based on extrapolations from discussions with a limited number of traders
Growth Rate of All Root Crops Sold at a Central Market	3% per annum growth rate	Useful to compare historical growth rates of pumpkins Examples of production increases from central market construction elsewhere
Market Size and Value for Frozen Sweet Potato	150kg /week at A\$3/kg growing at 5% a year	Assumes significant displacement of imports or additional demand created
Market Size and Value for frozen Cassava	150kg /week at A\$3/kg growing at 5% a year	Market surveys with consumer should be conducted to ascertain willingness to pay
Market Size and Value for Frozen Babai	100kg/week at A\$4/kg growing at 5% a year	MELAD trials should increase selling price / reduce purchase price to farmers to better reflect market reality

Realising these benefits requires a number of different actors to support the value chain as it develops. This includes the island councils (assumed to be managing the facilities on the island), MELAD staff (through expanded taste trials with consumers and retailers, extension support to farmers etc), retailers (by being willing to stock the products) and consumers (through their purchasing behaviour). It is important to emphasise that government support should not extend to substituting for the role of traders in the value chain i.e. they should not be involved in buying, transporting and selling produce. If the private sector is to be encouraged and stimulated to play these roles it cannot do so while the government is actively involved in subsidising the real costs of production.

## Displacement of Existing Activities

The analysis assumes that these government interventions displace consumer demand for imported products and this is replaced by demand for local products. This assumption is critical to the analysis as it allows us to include the full value of the increased production as a benefit to the economy. In the case of displacement of imported goods, the full value of the sales price of the product represents a benefit to the economy as every actor involved in the value chain and receiving a portion of the value is additional value created in Kiribati.

If this assumption of import displacement were not valid and, for example, an increased production of sweet potato and cassava led to displacement of pumpkin consumption and production, the analysis would overestimate the value of benefits.

The assumptions of full displacement of imported products is also partly supported by the fact that Kiribati (and in particular South Tarawa) has a growing population and therefore increasing demand for food and root crops.

## Data Constraints

Obtaining the necessary data to complete the analysis was not as straightforward as anticipated.

MELAD staff in South Tarawa did not have any up to date estimates of the current production levels of agricultural crops by island or the number of farmers on each island. Extension officers on each island may have this information but it was not available centrally and not collected during the timeframe of the analysis.

The population census provides general information, but it is not sufficiently detailed to determine production levels.

Price data for existing commodities was gathered through interviews with traders and retailers but is not collected regularly to examine trends over time.

A limited number of interviews took place with traders and retailers who attended a value chain workshop. They provided some insights into the value chain for pumpkins which was used to estimate the market size and possible constraints for the value chain for root crops. Additional interviews would provide more confidence in the assumptions made and should be conducted ahead of any further analysis.

There is uncertainty about the willingness of consumers to pay for untested commodities (local sweet potato, cassava, babai). Current prices for imported taro and cassava provide an upper ceiling. The analysis has used the

selling prices that were realised during the MELAD trials (A\$3/kg) but a private sector trader selling at these rates would need to lower the price paid to producers to account for their margins and transport costs.

Detailed cost information was not available for costs such as the maintenance and running costs for all options. They have been assumed to be 2% and 10% of the capital costs respectively in each option. Accurate cost information should be obtained to validate these assumptions. Informed decision making and the use of tools such as cost benefit analysis relies on access to reliable data and information. Investments should be made in improving the availability of information by staff at MELAD responsible for developing project proposals and project management.

## Methodological Constraints

Cost benefit analysis is a “marginal analysis” technique, meaning that it is most appropriate where the broader environment (e.g. the price of goods and services in the economy) can be assumed to be unchanged by the intervention (UK Government, Green Book, 2018). It is assumed that none of the above options would result in production changes large enough to alter prices.

It is possible, however, that the production increases assumed could disrupt the market sufficiently to lower prices – and indeed this may be desirable from a food and nutritional security perspective to improve accessibility to local food for everyone. If this were the case the analysis presented below is an over-estimate of the benefits. Given that South Tarawa’s population (and therefore market) has been growing at around 4.5% (GoK, 2012)<sup>9</sup> per annum over the last

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<sup>9</sup> Republic of Kiribati Island Report Series. South Tarawa. [http://www.climate.gov.ki/wp-content/uploads/2013/01/6\\_SOUTH-TARAWA-revised-2012.pdf](http://www.climate.gov.ki/wp-content/uploads/2013/01/6_SOUTH-TARAWA-revised-2012.pdf)

decade the assumed production growth rates of 3% (Option 1 – Central Market) and 5% (Solar freezers) are unlikely to be large enough to change prices significantly.

## Other Options that Should be Considered

In discussion with local traders, pest and disease issues and wastage emerged as critical constraints on production levels and options to support farmers and traders to address these options should be considered.

An additional option to investing in a large central market is to support the existing and expanded network of small road side

sellers that enable produce to be sold closer to consumers. As a key function of markets is to facilitate buyers and sellers coming together, investing in improvements to the facilities of small satellite markets would represent a lower cost and potentially have as great an impact on stimulating additional trade.

Photo 7: Informal roadside market in Taoreke, South Tarawa



## 5. Preliminary Results and Sensitivity Analysis

This section describes the results of each option considered and sensitivity analysis conducted.

**Option 1:** At an assumed cost of A\$300,000, growth in sales of 3% per annum and a reduction in wastage from 20% of goods transported to 10%, the investment would generate a net present value of A\$222,276. The benefit cost ratio is 1.31 – for every dollar invested A\$1.31 of benefits to the economy would be generated.

**Table 3: Option 1 – Central Market Construction**

	Central estimate (7% discount rate, 3% growth rate in sales)
Net Present Value	A\$222,276
Benefit Cost Ratio	1.31

The analysis uses a discount rate of 7%. Table 4 below provides results for discount rates of 4% and 10% to examine the robustness of the results to a range of possible discount rates.

**Table 4: Option 1 – Sensitivity Analysis**

	(4% discount rate, 3% growth rate in sales)	(10% discount rate, 3% growth rate in sales)
Net Present Value	A\$455,300	A\$69,203
Benefit Cost Ratio	1.56	1.11

The results are relatively sensitive to the discount rate chosen, and the benefit cost ratio is only marginally above 1 with a 10% discount rate. Further discussions with MFED officials should be conducted to validate the discount rate appropriate to the Kiribati economy.

Further sensitivity analysis was conducted as highlighted below for the following parameters: Reducing the assumed growth rate from 3% to 2% per annum and increasing the assumed maintenance costs from 2% of installation costs per annum to 5% per annum. Both of these demonstrate that the results are sensitive to the true value of these parameters.

If growth rates are below the projected 3% per annum, the investment of A\$300,000 in a central market is unlikely to generate positive returns.

Similarly, if maintenance costs are higher than 2% per annum, the benefit cost ratio drops to 1.1.

**Table 5: Option 1 – Sensitivity Analysis**

	(7% discount rate, 2% growth rate in sales)	(7% discount rate, 5% maintenance costs)
Net Present Value	- A\$19,217	A\$120,256
Benefit Cost Ratio	0.97	1.1

**Option 2:** For an investment of 5 solar freezers in South Tarawa and 2 for each island of Makin, Marakei and Buitaritari that are replaced every 5 years, the investment would generate a net present value of A\$90,524 over a 20- year period. The benefit cost ratio is 1.31 – for every dollar invested A\$1.31 of benefits to the economy would be generated.

**Table 6: Option 2 – Solar Freezer Investment**

	Central estimate (7% discount rate)
Net Present Value	A\$90,524
Benefit Cost Ratio	1.31

The analysis uses a discount rate of 7%. Table 7 below provides results for discount rates of 4% and 10% to examine the robustness of the results to a range of possible discount rates. The benefit cost ratio is relatively insensitive to changes in the discount rate.

**Table 7: Option 2 – Sensitivity Analysis**

	(4% discount rate)	(10% discount rate)
Net Present Value	A\$135,183	A\$61,135
Benefit Cost Ratio	1.38	1.26

Further sensitivity analysis was conducted to test the assumptions relating to higher transport costs and lower initial demand.

In the analysis transport costs associated with frozen produce were assumed to be twice that of other cargo. However, there is no accurate information on how frozen produce could be transported. Options relating to bringing the produce in on vessels currently used for fishing or investing in freezer storage options have not been fully explored. Depending on options available, transport costs could be significantly higher. Transport costs of an additional 200% above current rates would make the investments unviable.

Similarly, the investments in solar freezers are critically dependent on the projected demand and production of frozen root crops. Lower demand or supply could also result in the investments being unviable.

**Table 8: Option 2 – Sensitivity Analysis**

	200% additional transport costs	Lower demand scenario 1 (100kg week – sweet potato and cassava, 50kg babai)	Lower demand scenario 2 (75kg week – sweet potato and cassava, 50kg babai)
Net Present Value	-A\$27,196	A\$8,540	-A\$39,809
Benefit Cost Ratio	0.93	1.04	0.83



**Option 3:** The initial investments for commencing with small scale agro-processing are small (A\$2000) and it assumed that these investments would need to be repeated every 5 years. Given the low value of the initial investments, running costs of 50% of the value of the initial investment have been assumed. Training costs of A\$5000 are assumed in the initial year.

Critically this option depends on making use of waste products from the existing banana, pumpkin, pawpaw and breadfruit value chains so the opportunity costs of inputs for small scale production are low (assumed to be part of running costs).

Demand has been estimated conservatively as 50 packs of banana chips and 50 jars of jam a fortnight.

**Table 9: Option 3 – Small Scale Agro-Processing**

	Central estimate (7% discount rate)
Net Present Value	A\$34,075
Benefit Cost Ratio	2.51

For the initial investment in small-scale agro-processing a net present value of A\$ 34,075 would be generated over a 19-year period. The benefit cost ratio is 2.51 – for every dollar invested, A\$2.51 of benefits would be generated. These results are also not particularly sensitive to different assumptions about the discount rate (see below).

**Table 10: Option 3 – Sensitivity Analysis**

	(4% discount rate)	(10% discount rate)
Net Present Value	A\$44,102	A\$27,032
Benefit Cost Ratio	2.66	2.37

This option represents the least cost option by way of investments – and relatively good returns, therefore the least risk to government expenditure.

Further sensitivity analysis was conducted to test the assumptions relating to higher running costs. The central estimate above assumes running costs per annum of 50% of the initial investment costs. As the investment costs are relatively low, this may be an underestimate. Sensitivity analysis increasing them to 100% of the installation costs was conducted. With higher running costs the investment is still viable with a benefit cost ratio of 1.67.

**Table 11: Option 3 – Sensitivity Analysis**

	Running costs of 100% of installation costs
Net Present Value	A\$22,740
Benefit Cost Ratio	1.67

## 6. Discussion

The three options considered above for stimulating production and income generating agricultural activities in outer islands represent vastly different options in terms of investment and complexity for decision makers – ranging from a significant initial investment of A\$300,000 to construct a central market to A\$2000 to invest in small scale agro-processing.

Based on the results of the analysis, the small-scale agro-processing facility has the highest benefit cost ratio. Proceeding with Option 3 represents a relatively low-risk option for the GoK as there is also less uncertainty about the viable market for these products.

Investing in suitable training at the outset is vital to ensure quality production. MELAD and MCIC could also play a valuable role in ensuring that the produce is of suitable quality that major retailers in South Tarawa would be willing to stock it and in helping producers link to the market by introducing them to key value chain actors (MCIC, 2017).

The higher net present values generated by Option 1 and 2 have significant uncertainties associated with the results, in particular relating to the level of additional production and demand that would be stimulated and further analysis should be conducted to validate the estimates used in the analysis. As shown in the sensitivity analysis above relatively small changes to the assumed demand result in a negative net present value.

It is also not clear that Option 2 is possible as it relies on ensuring that the produce would stay frozen during transport (i.e. that a suitable shipping vessel has freezer storage). The assumed additional costs to traders to ship frozen goods are therefore very uncertain and the results highly sensitive to changes in this assumption.

**Table 12: Result Comparison**

	Option 1	Option 2	Option 3
<b>Net Present Value</b>	A\$222,276	A\$90,524	A\$34,075
<b>Benefit Cost Ratio</b>	1.31	1.31	2.51

The analysis demonstrates that improving market infrastructure and stimulating a local market for frozen root crops are potentially viable but further analysis is needed to obtain more accurate estimates of the size of the market and for transport costs.

The existing market for frozen taro and cassava demonstrates that there is a possible market opportunity, but further testing should be carried out by MELAD to determine if local produce could compete with imported produce based on quality, taste preference and price. The issue of reliable transport would also need to be solved.

Retailers on South Tarawa will not stock produce until the value chain has been demonstrated as being able to produce consistently and reliably so it is also questionable as to whether producers should attempt to compete with a value chain for imported produce that is currently functioning. It is expected that targeting local and roadside markets will be more efficient as they may be more receptive to new products and could help lay the foundation for demonstrating the reliability of the value chain.

The analysis also assumes that the interventions result in stimulating **additional economic** activity, as distinct from displacing existing economic activity. Youth unemployment is high and it is assumed that there is sufficient additional labour at the same wage rates for new economic activities.

# 7. Recommendations

## Invest Small and Learn by Doing

Investing in small-scale agro-processing on Buitaritari, with appropriate training and business support services provided to producers and traders, should proceed and represents a low risk option for government investment.

The feasibility study conducted (Beyer, 2018) also provides options for larger scale investment, should the small-scale agro-processing be successful.

Given the sensitivity of results to the level of demand, examining lower cost options for improving and expanding existing roadside market facilities – as distinct from constructing a new market facility – should also be explored. The existing market for pumpkins has developed without significant investment in infrastructure and could be replicated for sweet potato.

## Support Existing Value Chains and Private Sector Actors

It is vital that MELAD and MCIC work jointly to support existing value chains and private sector actors and ensure that work to stimulate additional production does not undermine existing value chains.

For example, in working to examine the viability of additional root crop production it is important that prices paid to producers for trials are realistic (and not inflated) reflecting a price that traders could pay in the future.

It is also clear that existing value chains have constraints that could be addressed. For example, wastage in the existing pumpkin value chain is high (approximately 20%) and working with producers and traders to identify options to improve post-harvest handling practices could result in additional supply reaching the market. Producers also reported pest and disease issues that could be addressed by MELAD extension services to address.

In attempting to ensure local and affordable food is available for consumers in South Tarawa, it is critical that existing value chain actors are supported to strengthen the current fragile value chains.

Value chain analysis can be a useful tool in helping to identify specific constraints and needs. Training in how to conduct value chain analysis should be conducted so that MELAD and MCIC staff are able to conduct this analysis for all the commodities they are working on.

## Demonstrate Viability of the Market for New Products

MELAD and MCIC have an important role in helping to stimulate untested products and market opportunities and to give traders and other private sector actors the confidence to enter the market. Part of this role can simply be to connect existing actors to each other.

The MELAD trials for root crops should continue to determine the viability of the market in terms of taste, quality and price preferences.

Working with existing traders to do this would help to stimulate their interest in the market. For example, MELAD ideally should not be selling any produce itself but simply facilitating others to do so as part of the trials.

## Improve Availability of Data to Support Analysis

This study was constrained by the limited information available for domestic production and trade of agricultural goods. Investing in improving data availability to support informed decision making is critical for value chain and/or cost benefit analysis to be conducted regularly.

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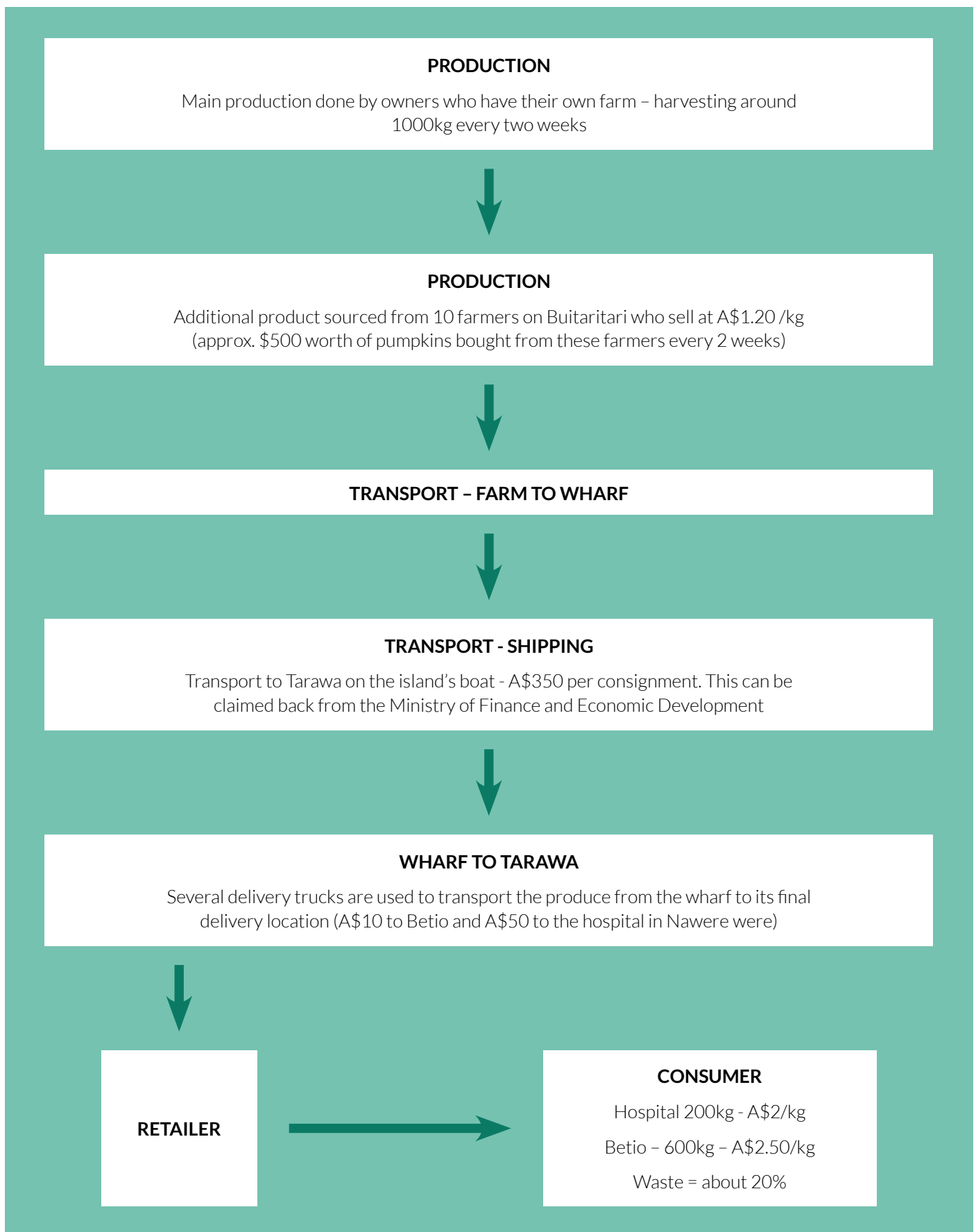
# Annexes

## Annex 1: Value Chain Mapping Analysis - Pumpkins from Buitaritari, Tarawa

### Part 1. List of Actors Involved in the Value Chain

Main actors – (those who buy and sell the product as it moves along the chain)	Supporting actors – (those who provide services to facilitate the movement of the product along the chain)
Farmers	Caretaker
Farmer / owner	Harvester (farmer / owner)
Roadside retailer (farmer / owner)	Product loaders (casual labourers)
Consumers	Shipping
	Transporters / Delivery staff

## Part 2. Putting Figures into the Map



## What Each Actor Contributes to the Final Product and the Returns They Receive:

Based on a harvest of 1000kg every two weeks:

Actor (participant in the value chain)	What the actor contributes to the final product	The cost of the actor's contribution	The reward the actor receives (share of the final selling price to the consumer)	Actor's risk
Farmers	Prepare land, planting, watering, pest management, harvesting	Time, water	<b>Paid A\$1.20 of sales price (A\$2-2.50)</b> <b>48-60%</b>	Pests, theft, wastage, weather conditions
Caretaker	Manages the farm, watering, pest management, pollinating	Wages (A\$110 per fortnight)	<b>Estimated share of consumer price: 5.5%</b>	Pests, weather conditions
Transport providers for owner / harvester (air and sea)	Travels to Buitaritari to harvest the crop by air, returns with the crop by boat	A\$50 boat x 2 A\$95 flight x 2	<b>Estimated share of consumer price: 14.5%</b>	Wastage (20%)
Transport (truck)	Travel from farm to wharf	Time, use of truck A\$15 per load	<b>Estimated share of consumer price: 0.8%</b>	
Transport provider (shipping)	Transports the good from Buitaritari to Tarawa	A\$350 per consignment which is fully reclaimed from MFED	<b>Estimated share of consumer purchase price: 17.5%</b>	
Delivery truck	Deliver produce from wharf to customers	A\$50 – Betio wharf – hospital A\$10 in Betio	<b>Estimated importer/wholesaler share of the consumer purchase price: 3%</b>	
Retailer		Sold for A\$2/kg to hospital  A\$2.50 / kg directly	<b>Estimated retailers share of the consumer purchase price: 11% (retail price)</b>	Not all produce is sold
Consumer				

## Value Chain

Pumpkins from Butaritari - Tarawa							
Parameters							
Based on harvesting 1000kg - every 2 weeks - and selling 800kg				20% waste	Abaiang	1.5	farm gate price
Pumpkins harvested	1000						
Pumpkins sold	800						
Wastage	20%						
Selling (retail) price	A\$2.5						
Wholesale price (to govt buyers)	A\$2						
Actor	Price/kg		Share				
Farmers	A\$1.2		48.0%				
Farm manager / caretaker	A\$0.14	110	5.5%				
Air Kiribati (Flights - for harvesters)	A\$0.24	190	9.5%				
Transport provider (Butaritari)	A\$0.019	15	0.8%				
Shipping (cargo)	A\$0.43	350	17.5%	Subsidized by MFED			
Shipping (passenger)	A\$0.14	100	5.0%				
Transport (Tarawa)	A\$0.08	60	3.0%				
Retailer / owner	A\$0.27		10.8%				

## Financial Analysis

Sample pumpkin farmer / retailer				
Parameters				
Volume harvested (kg)	1000			
Wastage between farm gate and retailer	10%			
Volume of sales (kg)	900			
Price (wholesale - low)	A\$2			
Price (retail - high)	A\$2.5			
Costs				
Pumpkins	A\$500	fortnight	48.0%	
Caretaker (wages)	A\$110	fortnight	5.5%	
Shipping	A\$350	per 1000kg	9.5%	
Flights	A\$95	pp	0.8%	
Ship (passengers)	A\$50	pp	17.5%	
Sales staff	A\$80	fortnight	5.0%	assumed
Transport (Butaritari)	A\$15	60	3.0%	
Transport (Betio wharf - Betio)	A\$10		10.8%	
Transport (Betio wharf - hospital)	A\$50			
Business license fees	A\$300	per license – requirement: one in Butaritari and one in Tarawa		
Sales 800 kg				
Revenue	% split	Revenue		
Hospital / MTC	25%	A\$450		
Retail in Betio	75%	A\$1687.5		
Total costs 1000kg				
Pumpkins (from other farmers)	A\$500			
Caretaker	A\$110			
Flights (2 people)	A\$190			

Shipping – freight	A\$350			
Shipping (2 passengers)	A\$100			
Ground transport (Butaritari/ Betio/Tarawa)	A\$75			
Sales staff	A\$80			
<b>Financial costs</b>				
Fortnightly costs (1000kg)	A\$1405			
Annual costs (production)	A\$28100	20 fortnights		
License fees	A\$600			
Total costs	A\$28700			
<b>Revenue</b>				
Revenue (fortnight)	A\$2137.5			
Annual revenue (20 fortnights)	A\$42750			
Revenue – costs	A\$14050			
<b>Returns</b>				
Annual returns	A\$14050	Does not account for payments to self		
Freight subsidy refund	A\$7000			
	<b>A\$21050</b>			



## Pumpkin Trade

Domestic trade figures (weekly / kg)				
5kg /pumpkin				
Traders	Volume			
Real Trader 1	500	1000kg	Buitaritari	1 shipment / fortnight
Real Trader 2	182.5	365kg	Buitaritari	1 shipment / fortnight
Real Trader 3	100	10 pieces per boat	Abaiang	2 shipments / week
<b>Imaginary Trader #1</b>	500			
<b>Imaginary trader #2</b>	500			
<b>Volume shipped</b>	<b>1782.5</b>			
<b>Wastage (20%)</b>	356.5			
<b>Volume sold</b>	<b>1426</b>			

## Annex 2: Stakeholder Consultation List

Name	Organisation
Kiritian Batoromaio, Project Officer Iuta Metai, Project Officer Susana Ratu, Principal Agriculture Officer Beraina Teirane, Senior Project Officer	Ministry of Environment, Land and Agricultural Development (MELAD)
Norma M. Rivera, Program Officer	Global Green Growth Institute
Aribo Briantaki Rereti Ioakim Bareti Matia "Timo"	Pumpkin traders
Willie Maen, Operations Manager	MOEL Trading
Unavailable	Punjas, Betio Office
John Oakeshott	SPC
Richard Beyer	Independent agro-processing consultant

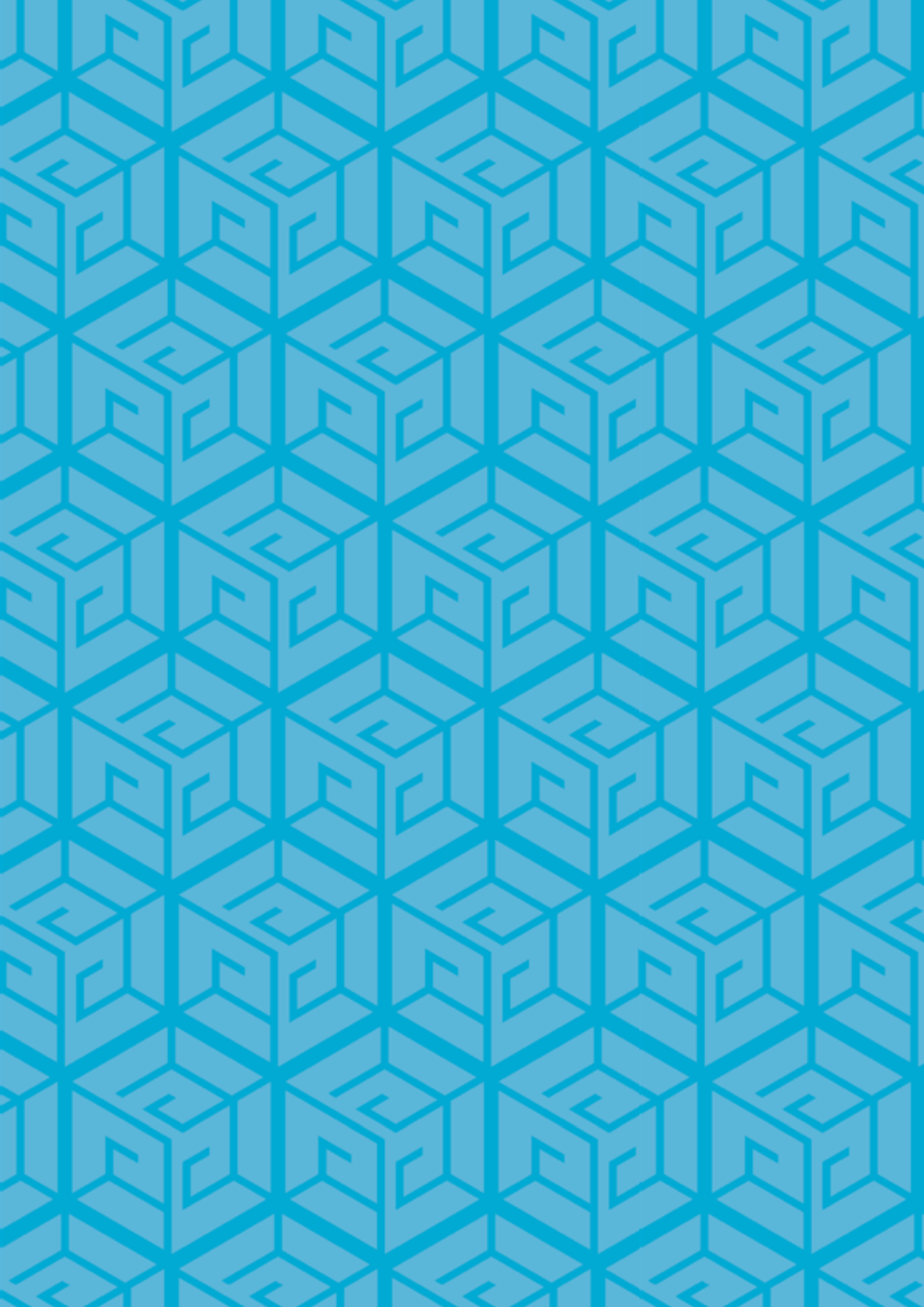




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