

Trash or Treasure?

Repurposing unmarketable fruit produced by the Mid West Horticulture Growers



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Executive Summary

The Northern Agricultural Catchments Council (NACC) provided grant funding to the Mid West Horticulture Grower Group Inc. to research opportunities for repurposing vegetable waste produced in the Geraldton Horticulture Precinct.

The Geraldton Horticulture Precinct is comprised of three separate growing areas:

- Moonyonooka
- Walkaway and
- Glenfield

Most of the horticulture growers in Geraldton are of Vietnamese descent. They grow cucumbers, tomatoes, capsicums, eggplants and zucchini for the Australian domestic market. They are price takers and not price setters.

In the recent past, the Geraldton horticulture industry has been negatively impacted by several issues:

- The increasing price of scheme water, currently \$3.17/kilolitre and set to rise to \$4.10/kilolitre on July 1, 2018
- Biosecurity issues such as the Tomato Potato Psyllid and the Cucumber Green Mottled Mosaic Virus
- The very dry conditions that prevailed at the beginning of the 2017 growing season and
- Oversupply of cucumbers in the domestic market in 2017 and subsequent low prices.

With the threat of state and territory borders shutting and the ever-increasing price of water, the growers are now at a cross road and finding pathways to sustainability has become more important than ever.

Vegetables Australia Fact Sheet on Waste (2013) estimated that nationally 25% of vegetable production goes to waste and finding profitable uses for this waste would benefit the industry. Currently, there is negligible repurposing of vegetable waste in Geraldton.

This study examined opportunities for repurposing waste so that Growers can make informed decisions.

This Study examined:

1. Composting – traditional and other alternatives
2. On-selling vegetable fruit waste and
3. Creating value added food and other products

List of Recommendations

Number	Recommendation
1	That composting on-site of crop waste is not recommended due to the stringent Australian Standards and the West Australian Environmental Standard for Composting that must be followed. This study recommends disposing of crop waste using alternative methods such as biochar and an anaerobic digester.
2	This study recommends that biosecurity concerns of the growers can be addressed by repurposing crop waste into biochar. The advantage of biochar is that diseased crop waste can be disposed of effectively without fear of further contamination and the resulting biochar can be used as a soil conditioner.
3	This study recommends trialling an anaerobic digester to: <ol style="list-style-type: none"> i. Examine the efficiency of an anaerobic biodigester to turn crop waste to produce biogas that has potential economic value. ii. Examine the benefits of using digestate as a nutrient rich compost compared to the cheap potting mix currently used by the growers.
4	This study recommends that the Mid West Horticulture Grower Group Inc commences a dialogue with the Carnarvon horticulture growers to progress opportunities for on-selling fruit waste to Carnarvon.
5	This study recommends that <ol style="list-style-type: none"> i. 1-2 representatives from the Mid West Horticulture Grower Group Inc. attend the Australian Society of Cosmetic Chemists Conference at Fremantle in May 2019.

Opportunity

During this study it became apparent that it is conceivable that a cucumber grown in Geraldton and retailed by a major supermarket chain in Geraldton may have been packed in Adelaide.

1. There is opportunity to develop an App to connect suppliers and retailers to reduce food miles. This is about reducing transport costs and not wasting shelf life by getting product onto shelf fresher and cheaper.
2. Develop an App, which allows consumers to find out where the vegetable was grown in Australia (ie: which State and Region). This is about building consumer loyalty and maintaining market share. It would underpin provenance and opportunity to build clean green Mid West produce like King Island, Tasmania.

Geraldton Horticulture Precinct

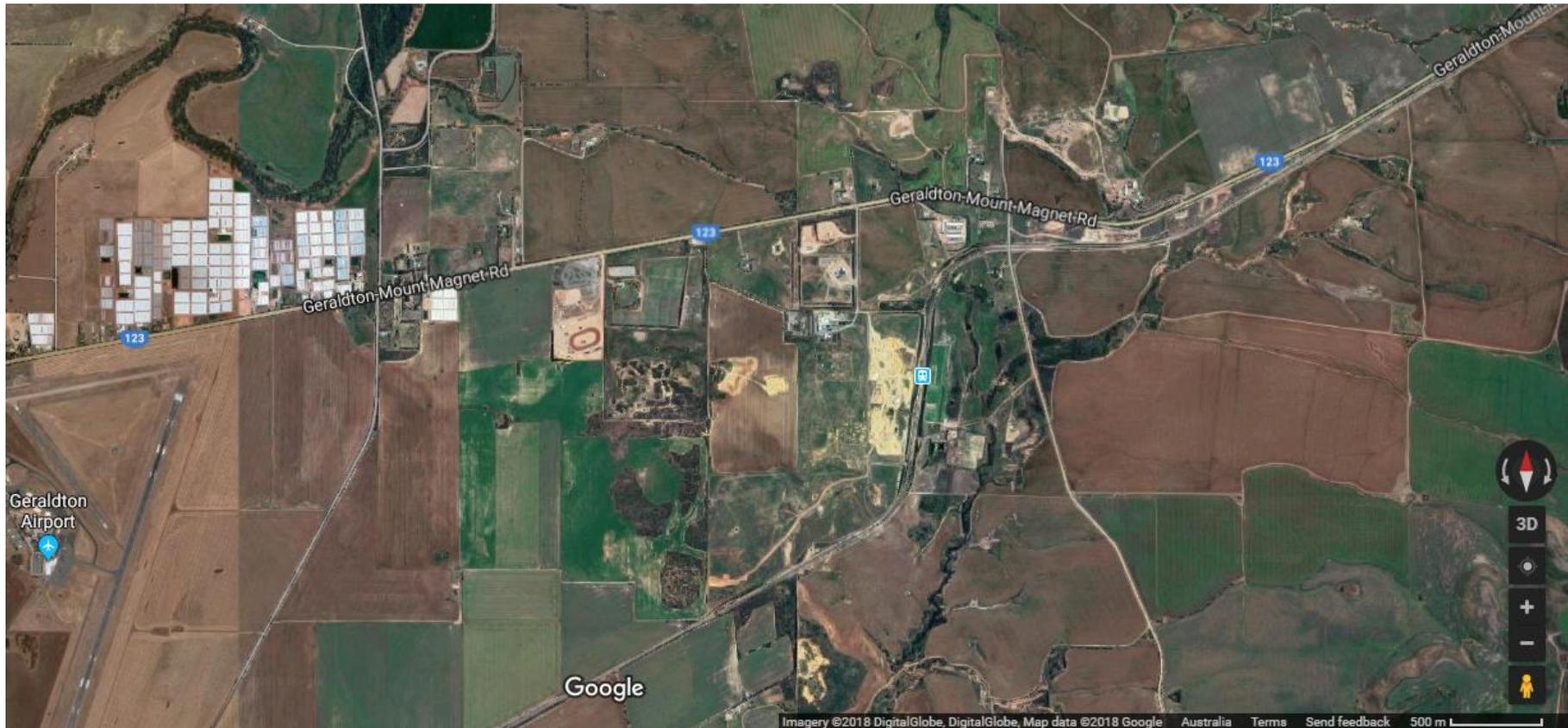


Figure 1. Google aerial photo showing horticulture farms in the Moonyoonooka growing area.

Introduction

Protected horticultural production in plastic tunnel houses has expanded significantly in Geraldton in the last 15 years. The predominant crop is winter cucumbers which are distributed Australia wide. Other crops include open field and protected tomatoes, protected capsicums, protected eggplant and open field melons in summer.

A significant amount of cucumbers grown in Geraldton are transported in bulk bins to packhouses in Adelaide and Sydney. The cucumbers from these packhouses are then distributed nationally to retail outlets. Other vegetables produced are sold via agents at the Canningvale Markets.

There are about 20 horticulture enterprises in Geraldton, predominantly Vietnamese family businesses, and the estimated annual value of production exceeds \$20-million. Up till now this industry has succeeded through the entrepreneurial skills of the Growers, with no assistance from government.

Vegetables Australia Fact Sheet on Waste (2013) estimated that 25% of vegetable production goes to waste because it does not meet market specifications. Large retailers such as Woolworths, Coles, Aldi and IGA specify exact dimensions (length and width) the vegetables must be for sale to the public. Failure to meet these stringent specifications result in the produce being discarded as waste. Finding profitable uses for the misshapen vegetables would significantly benefit the Australian vegetable industry.

Sweeter Banana Company in Carnarvon faced similar challenges many years ago with small bananas being discarded as waste for failing to meet supermarket specifications. The Sweeter Banana Company devised a clever marketing campaign and the *lunch box banana* was born. These Carnarvon bananas have since gained iconic status in WA for their small size and sweet taste. The lunch box bananas now command the same price as the larger bananas.

More consumer education and marketing are required to promote '*The Odd Bunch*' currently sold at Woolworths Supermarkets nationally. These fruit and vegetables are perfect except for their shapes (too long or short, too thin or fat or with a twist). Many young children find misshapen fruit and vegetable more interesting to eat than perfectly formed fruit. There is opportunity for a targeted marketing campaign to get more young children eating vegetables by promoting interesting and funny shaped produce.

This study focusses on repurposing vegetable waste at farm scale in the Geraldton Horticulture Precinct.

Quantifying the amount of waste was not part of this study and as such we do not know how much waste is generated annually. Never the less, the economic value from horticulture could be significantly higher if the fruit waste could be repurposed.

It should be noted that many of the Geraldton growers are least interested in value adding opportunities. They work very hard growing vegetable and their focus is on selling their produce at the best price. Also, the amount of fruit waste varies during the year. Consequently, volume cannot be guaranteed. However, some of the Growers are 'open' to selling their fruit waste if it can fetch a reasonable price as they still must pick and pack the fruit.

Figure 2 highlights that waste occurs in the entire supply chain and not just at the farm.

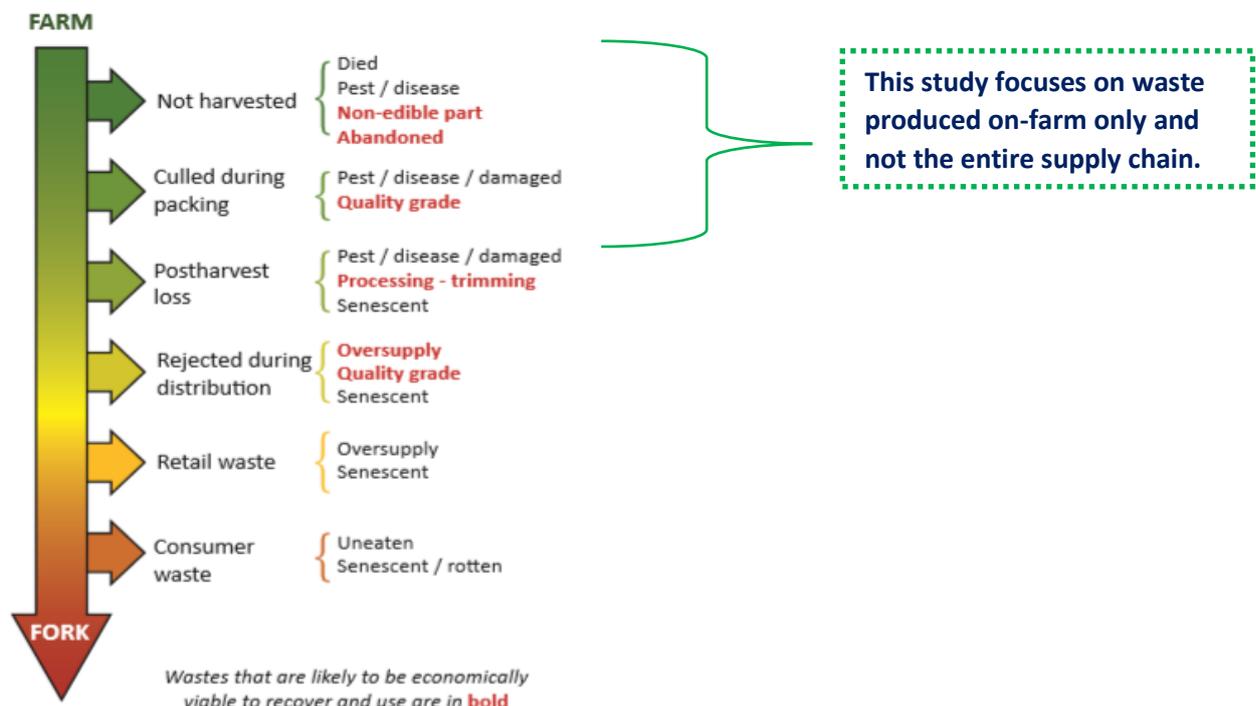


Figure 2. Captures the possible fates of fruit between the production area on the farm and the consumers' plate. Reproduced from Vegetables Australia Fact Sheet on Waste (2013)

In Table 1 capsicum has been highlighted, as it is a crop that is grown in the Geraldton Horticulture Precinct. According to Vegetables Australia (2013) in Australia approximately 26% of capsicums grown and valued at \$13.8M was considered as waste because it did not meet supermarket specifications. At a local level, this study does not have the data to quantify the amount of capsicums waste. However, it can be assumed to be a similar proportion.

Table 1. Reproduced from Vegetables Australia Fact Sheet (2013) estimates for crop waste in Australia

Crop	Area planted (Ha)	Average Yield (t/ha)	Total Production (kt/year)	Total Waste (kt)	Total Waste (%)	Value of Waste (\$ million)
carrots	4,600	65	300	93	31	24.0
capsicums	2,300	52	120	31	26	13.8
cauliflower	2,500	30	75	28	37	19.6
sweet corn	6,700	15	100	27	27	14.3
cabbage	2,000	27 (64 proc)	73	20	27	9.7
baby leaf TP	4,500	35	158	19	12	38.8
lettuce	4,500	27 (38 proc)	124	17	14	7.4
broccoli	7,000	7	49	15	31	16.7
beans	6,000	8.5	51	13	25	2.2
beetroot	900	40	36	10	28	1.2
baby leaf DS	3,500	8.5	30	3.5	12	6.9
Total	44,500		1,116	276.5	25	154.7

Methodology

The methodology used for this study was desktop research along with several informal grower and other industry interviews.

The desktop research identified value- adding opportunities available to the Geraldton horticulture growers.

This study explored two areas:

1. Crop Waste

- How to dispose of crop waste and improve biosecurity.
- Can crop waste be composted? If yes, what are the legal requirements?

2. Fruit Waste – What do we do with fruit that does not meet market specification?

- Can the vegetables be juiced, pickled or turned into other high value products?
- What are the likely start-up costs?
- Is there opportunity to on-sell vegetable seconds to the other value add producers in WA?

Crop Waste - options for repurposing

Biosecurity concerns

In recent years the Geraldton Growers have faced several biosecurity concerns such as the Tomato Potato Psyllid and Cucumber Green Mottled Mosaic Virus which threatened market access to other States. While the fruit is sold to distributors, the growers are left to dispose of crop waste.

The current practice is for crop waste to be ploughed back into the ground on-farm. However, this poses the risk of pathogens and other contaminants being ploughed back into the ground contributing to disease carry over. Disposing of crop waste to break disease cycle and enhance biosecurity protocol is very important for the sustainability of the industry.

Composting

Composting is defined as an organic product that has undergone controlled aerobic and thermophilic biological transformation through the composting process to achieve pasteurisation and reduce phytotoxic compounds and has achieved a specified level of maturity for compost.

Making your own compost can be done on-site. However, **Australian Standards** must be followed to ensure pathogens are killed during the composting process. **(Refer to Attachment)**. **In addition, the WA Environmental Standard for Composting (Refer to Attachment)** must also be followed.

Aerobic composting facilities pose potential risks to public health and the environment and must ensure the following concerns are addressed:

- (a) contamination of groundwater;
- (b) contamination of surface water;
- (c) contamination of soil;
- (d) odour; and
- (e) contamination of products.

In addition to the Australian Standards and the West Australian Environmental Standard for Composting, the following is also required:

- Adequate room to compost the volume of waste
- Time to source and collect brown waste
- Green matter that is disease free
- Having the correct ratio of brown to green waste
- Time for the inputs to breakdown into compost
- Anecdotal evidence suggests that the cucumber seeds need to be 'cooked' twice (compost must reach 60°C) to render the seeds unviable.

Given the stringent standards that **MUST** be implemented, it is easier for the growers to purchase ready-made compost instead of composting crop waste on-site.

Recommendation 1

That composting on-site of crop waste is **not** recommended due to the stringent Australian Standards and the West Australian Environmental Standard for Composting that must be followed.

This study recommends disposing of crop waste using alternatives methods such as biochar and an anaerobic digester.

Current Use of Compost

Currently, the growers use compost to add nutrient value to poor sandy soils. They were purchasing compost from Patience Sandlands in Geraldton. However, this company no longer produces compost, leaving some growers to resort to using cheap potting mix to improve their soils.

Alternatives to Composting: Biochar

Biochar is made from agriculture residue such as poultry litter, stubble, lupin trash and wood stock that is slowly burnt under restricted oxygen conditions resulting in a charcoal.

Biosecurity concerns can be addressed by repurposing crop waste into biochar. The advantage of biochar is that diseased crop waste can be disposed of effectively without fear of further contamination and the resulting biochar can be used as a soil conditioner.

Energy Farmers Australia claim that biochar benefits the habitat for soil microbes and increases the moisture holding capacity of the soil. It also claims that for every tonne of biochar that is put in the ground, there is **potential to generate carbon credits**.

Energy Farmers Australia has been working in partnership with one of the Geraldton horticulture growers to turn chicken manure into biochar for use as a soil conditioner on poor sandy soils. Early results of this trial are promising. Poultry litter biochar is valued at about \$750/t with other biochar products range from \$100-\$1000/t.

The potential benefits of biochar are:

- Habitat for soil microbes;
- Increasing the nutrient and moisture holding capacity of the soil and
- Generate carbon credits that could also be used to promote the Geraldton horticulture producers and their contribution to the environmental sustainability of the industry.

Recommendation 2

This study recommends that biosecurity concerns of the growers can be addressed by repurposing crop waste into biochar.

The advantage of biochar is that diseased crop waste can be disposed of effectively without fear of further contamination and the resulting biochar can be used as a soil conditioner.

Anaerobic Biodigester

The anaerobic biodigester designed by **Energy Farmers Australia** addresses the disposal of crop waste (green waste).

The anaerobic biodigester turns crop waste into:

- Biogas (methane) and
- Digestate which is a nutrient rich compost – fertiliser and
- Potentially generate carbon credits.

The anaerobic digester is a process where organisms and microbes break down organic wastes in the absence of oxygen to produce biogas.

Biogas is rich in methane and could be used on-farm to provide fuel for generators to power water pumps. Potentially this could reduce energy input costs for the growers.

The **digestate** could lower the input cost of purchasing potting mix for use as a soil conditioner. Previously cucumber seeds were sent to Perth to be grown out at The Seedling Factory. However, several growers are now using cheap potting mix placed directly onto the soil to grow cucumber seeds. The digestate might be more beneficial and economical, than the cheap potting mix.

An anaerobic biodigester is relatively cheap to purchase with the approximate cost estimated at under \$5,000.

Recommendation 3

This study recommends trialling an anaerobic digester to:

- iii. Examine the efficiency of an anaerobic biodigester to turn crop waste into biogas with potential economic value.
- iv. Examine the benefits of using digestate as a nutrient rich compost compared to the cheap potting mix currently used by growers.

Fruit Waste – Options for Repurposing

Feeding vegetable seconds to sheep

Several growers feed vegetable fruit waste to their sheep which are said to prefer cucumbers and capsicums, over tomatoes. It could be assumed that tomatoes have a higher acidity level compared to cucumbers and capsicums. The growers are yet to taste the sheep meat to find out if it tastes different to normal lamb / mutton.

Nationally there are examples of farmers feeding their animals fruit and vegetable waste and by doing so altering the flavour of the meat. For example, John Stanley (Manjimup farmer) now demands a premium price for his chestnut fed pork which tastes quite different to normal pork. His pork is sold nationally through boutique butchers and served at top end restaurants. Similarly, sheep fed on samphire command a higher premium than regular lamb.

This could potentially be a trial project with local sheep meat producers.

Value add opportunities for vegetables grown at the Geraldton Horticulture Precinct

This study found that vegetables grown at the Geraldton horticulture precinct are able to be value added as juices, pickles, sauces, alcohol and in cosmetics.

Table 2. The following table indicates value add products that can be created from vegetables grown in the Geraldton.

Vegetable	Juice	European / Asian Pickles	Sauces	Other
Capsicum	✓	✓	✓	-
Cucumber	✓	✓	-	Cosmetics; Alcohol
Eggplant	✓	✓	✓	-
Tomatoes	✓	✓	✓	Tomato essence; Alcohol;

Juicing

All the vegetables grown at the Geraldton Horticulture Precinct can be juiced to create cold pressed juices or for inclusion in other value add products.

Cucumber juice is particularly sought after as it is a flavourless extender. It is widely used to bulk out other more expensive juices. It is also used in the cosmetic industry.

Tomato, capsicum and eggplant can also be juiced and used in value add products.

Internationally there is a juicing craze which has resulted in a high demand for cold pressed fruit and vegetable juices. The cold pressed juices are best consumed immediately so that the nutrient value is at an optimum. There are several cold pressed juicing companies based in Perth; however, it is a highly competitive market. The juicing companies source their raw products from growers in Wanneroo and from the South West of Western Australia.

Until recently, Carnarvon growers were transporting their seconds to Manjimup's Born Pure / Fresh Produce Alliance (FPA) to be value-added into juice and baby foods. The Fresh Produce Alliance is a Western Australian food processor based in Manjimup.

Fresh Produce Alliance previously produced many juices, baby foods and foods for the elderly. They were sourcing fruit and vegetables from throughout Western Australia for use in their products. However, they have decided to focus on the more profitable avocado market only.

This is unfortunate given that most baby foods sold in Australian supermarkets are imported from the United States of America. There is opportunity to develop this market with targeted consumer education about food miles, food safety and the need to buy local.

The Gascoyne Development Commission, Carnarvon growers and Curtin University have conducted extensive research into the fruit and vegetable waste generated in Carnarvon. They have done extensive research on value adding to tomatoes, capsicums, eggplant and zucchini. It has produced product samples and are looking at export opportunities in Asia.

Logistically, it is cheaper to transport vegetable fruit waste from Geraldton to Carnarvon than to Manjimup. The produce will be fresher and retain more nutrients than sourcing vegetables from further afield. The Carnarvon Horticulture Precinct already produces vegetables for the West Australian domestic market with trucks regularly transporting produce to Perth. On their return journey to Carnarvon, these trucks could **backhaul** the Geraldton vegetable fruit waste.

Figure 2 is a story featured on ABC Radio which provides details of the research already underway in Carnarvon to reduce fruit and vegetable waste.

Gascoyne seafood warehouse turns to local fruit and vegetables to help cut waste, use facilities

WA Country Hour By Michelle Stanley
Posted 5 September 2017 at 3:55 am

While taking a whiff of what is cooking in any old seafood factory might not be the most appealing thought, in Peter Jecks' Abacus Fisheries warehouse, the smell is actually rather enticing.

That is because, aside from the blue swimmer crabs, snapper, and scallops being packed and loaded into trucks, Mr Jecks is also trialling working with the produce from local fruit and vegetable growers.

The Abacus Fisheries warehouse was designed to have the capacity to not just sort and pack seafood but also to value-add seafood produce before it was sent to market.

For example, instead of only sending whole blue swimmer crabs to market, Mr Jecks is also able to send packages of crab meat alone which maximises profits, and reduces the amount of waste produce.

Mr Jecks has opened up his facility to local growers and industry bodies including the Gascoyne Food Council, the Gascoyne Development Commission, and Curtin University to help reduce some of the **estimated 3,000 tonnes of wasted fruit and vegetables** from the region.

"We are sensational as a region with the produce we have here, and so it's about looking at how we can maximise the products," he said.

Over three days, a team of producers and chefs prepared a number of dishes including ratatouille and salsa, and trialled recipes with vegetables from the region such as pumpkin, asparagus, capsicum, and tomato.

Figure 2. Reproduced from ABC WA Country Hour website. It highlights the research already underway in Carnarvon to repurpose fruit and vegetable waste.

Recommendation 4

This Study recommends that the Mid West Horticulture Grower Group Inc. commences a dialogue with the Carnarvon horticulture growers to progress opportunities for on-selling of fruit waste to them.

Italian Pasta Sauce

According to the Food and Beverage Market in China (2015), China continues to be the world's largest consumer market for food and beverage products, surpassing the United States in 2011. The Chinese food service sector had a turnover in 2014 of €440 billion. A key growth driver in the Chinese economy has been the rapid rise in average household incomes. Over the past ten years, China has experienced an average GDP growth of approximately 10%, which has created a new middle-income group with much higher disposable incomes. In addition, Chinese urban populations have increased by an estimated 153 million over the past ten years (2005-2015). By 2025, it is expected that urban areas will grow from 607 million to 822 million people.

The recent food safety scandals have damaged confidence and trust in China's food production processes and standards. Chinese consumers are increasingly concerned about the authenticity and safety of the food they consume and are willing to pay a higher premium for 'safe' foods.

Italian food is becoming increasingly popular in Asia with the millennials. Factors that have attributed to this are travel and social media. Italian producers have not been able to keep up with the demand from Asia and are now supplementing their products with those produced in Australia. Logistically Western Australia is closer to Asia than Italy is to Asia and with a more robust marketing campaign could make inroads into this lucrative market.

Many Chinese consumers indicated they enjoyed preparing spaghetti and pasta sauce at home. Napolitana were the most popular pasta sauces sold at Chinese supermarkets. The Italian food products currently sold in China target the time-poor white-collar workers by reducing preparation times for pasta and sauce meals. Based on consumer feedback, future opportunities exist in organic, all-natural, GMO free products and health benefit potential such as lowering blood pressure. Companies with 'better-for-you' health messaging are gaining momentum and market share.

[Gifting of premium sauces and seasonings is also popular.](#)

Table 3 highlights the most popular Italian pasta sauce brands in China. Three US brands (Hunts, Heinz and Gallo) have the largest market share, followed by Australia's Leggos and the Italian brand Sacla. A 350gram jar of organic pasta sauce by Alce Nero cost RMB 39.90, the equivalent of \$AUD8.00.

Table 3. popular brands of Italian pasta sauce in China. Reproduced from China insights on category opportunities for Australian exporters 2017

Brands

Major brands (pasta sauce)

- Hunts
- Heinz
- Gallo
- Leggos
- Sacla

USA Companies

Italian

Niche brands (pasta sauce)

- Paul Newman's
- Prego
- San Remo

Major brands (condiments)

- Kew Pie
- Kuhne
- Lesieur
- Masterfoods
- East West
- Masterfoods (spices)

Niche brands (condiments)

- A1 Steak Sauce
- Lawry's
- Forelli's
- Tabasco
- Fountain

Australian

Selected product information

Product	Retailer	Manufacturer	Origin	Serving size	Price (Rmb)
Sweet Mayonnaise	Vanguard	Kewpie	China	200g	12.50
Steak Sauce	Parksons	Kuhne	Germany	250ml	18.80
Pesto	April Gourmet	Sacla	Italy	270g	32.50
Organic Pasta Sauce	BLT	Alce Nero	Italy	350g	39.90
Herb Mustard	City Shop	Delouis	France	200g	29.80

= \$8 AUD

Geraldton's Sister Cities in China

Geraldton has sister city relationships with two Chinese cities:

- Zhanjiang City, Guangdong Province
- Zhoushan City, Zhejiang Province

Should the Geraldton horticulture growers decide to pursue producing Italian style pasta sauces and pickles, it would be prudent to leverage our sister city relationships to achieve positive marketing outcomes.

Although Australia has a Free Trade Agreement with China, it takes individual companies many years to develop networks into this market. Locally, the Geraldton Fishermen's Co-op has achieved this by selling the Western Rock Lobster in China. They might be willing to share their experience on how to break into the Chinese market.

Alcohol

There is opportunity to repurpose vegetables into alcoholic beverages. There are many Australian examples of growers producing alcohol such as the carrot growers in Queensland who are repurposing carrots into beer and vodka.

Carrot vodka the latest approach to reduce food waste by spirited vegetable growers

ABC Radio Brisbane By Jessica Hinchliffe

Posted 19 Jun 2017, 9:47am



PHOTO: Jason Hannay and Gen Windley are using carrots to create a unique style of vodka. (Supplied: Alice Gorman)

What happens to the carrots that don't make the quality cut for supermarket chains?

RELATED STORY: [Irrigators test the waters with new app](#)

In south-east Queensland, two farmers' wives have come together to create a unique style of vodka using the leftover vegies.

Alice Gorman and Gen Windley said they were inspired by a foray into carrot beer.

Figure 3. Reproduced by ABC Radio Brisbane website. It features a Queensland carrot grower who is repurposing carrot waste into beer and vodka.

The Dongara's Illegal Tender Rum Company was approached informally, to ascertain if they would be interested in producing other alcoholic beverages but at this stage they are concentrating on producing rum.

Food Safety

Food safety is paramount when creating value add food products.

HACCP (Hazard Analysis and Critical Control Points) is a food safety and risk assessment plan that was originally developed by NASA in the 1960's. The HACCP principles are important for businesses involved in the food industry because they help to maintain best food safety practices and reduce the risks of contamination caused illness.

Commercial Kitchens in Geraldton

For entrepreneurs contemplating creating value added food products, it is highly recommended that an accredited commercial kitchen be hired on a short-term basis instead of producing food items at home.

While Central Regional TAFE and Dalglish commercial kitchens are not available for hire to the public, there are numerous commercial kitchens available for short term hire in Geraldton.

The Table below lists Geraldton commercial kitchens that have HACCP accreditation and are available for short term hire.

Table 4: HACCP accredited commercial kitchens in Geraldton

Rovers Football Club	Geraldton Hockey Club
Towns Football Club	School Canteens
Railways Football Club	Geraldton Bowling Club

The City of Greater Geraldton provides a free on-line food handling safety training course. It is highly recommended that anyone wishing to prepare food items (juicing, jams, chutneys and pickles) completes this on-line training course.

Cosmetics

Cucumber juice has long been used in cosmetics since ancient times. Cucumbers are an excellent source of silica and antioxidants and used in skin and hair care products. Cucumber contains fragrant components that are non-sensitive to skin. As such it can be used to enhance the natural scent of a cosmetic product without any negative impacts.

Coincidentally, the Annual Conference of the Australian Society of Cosmetic Chemists is being held in May 2019 at Fremantle. It might be prudent for a representative from the Mid West Horticulture Grower Group Inc. to attend this conference to connect with industry leaders, as well as finding out about the latest development in the industry.

Recommendation 5

This Study recommends that 1-2 representatives from the Mid West Horticulture Grower Group Inc. attend the Australian Society of Cosmetic Chemists Conference at Fremantle in May 2019.

Conclusion

This study recommends that the Mid West Horticulture Grower Group Inc.:

1. Conducts a further study to quantify vegetable fruit waste generated in the Geraldton horticulture precinct;
2. Commences dialogue with the Gascoyne Development Commission to ascertain the possibility of selling Geraldton fruit waste to Carnarvon for use in value added products.

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