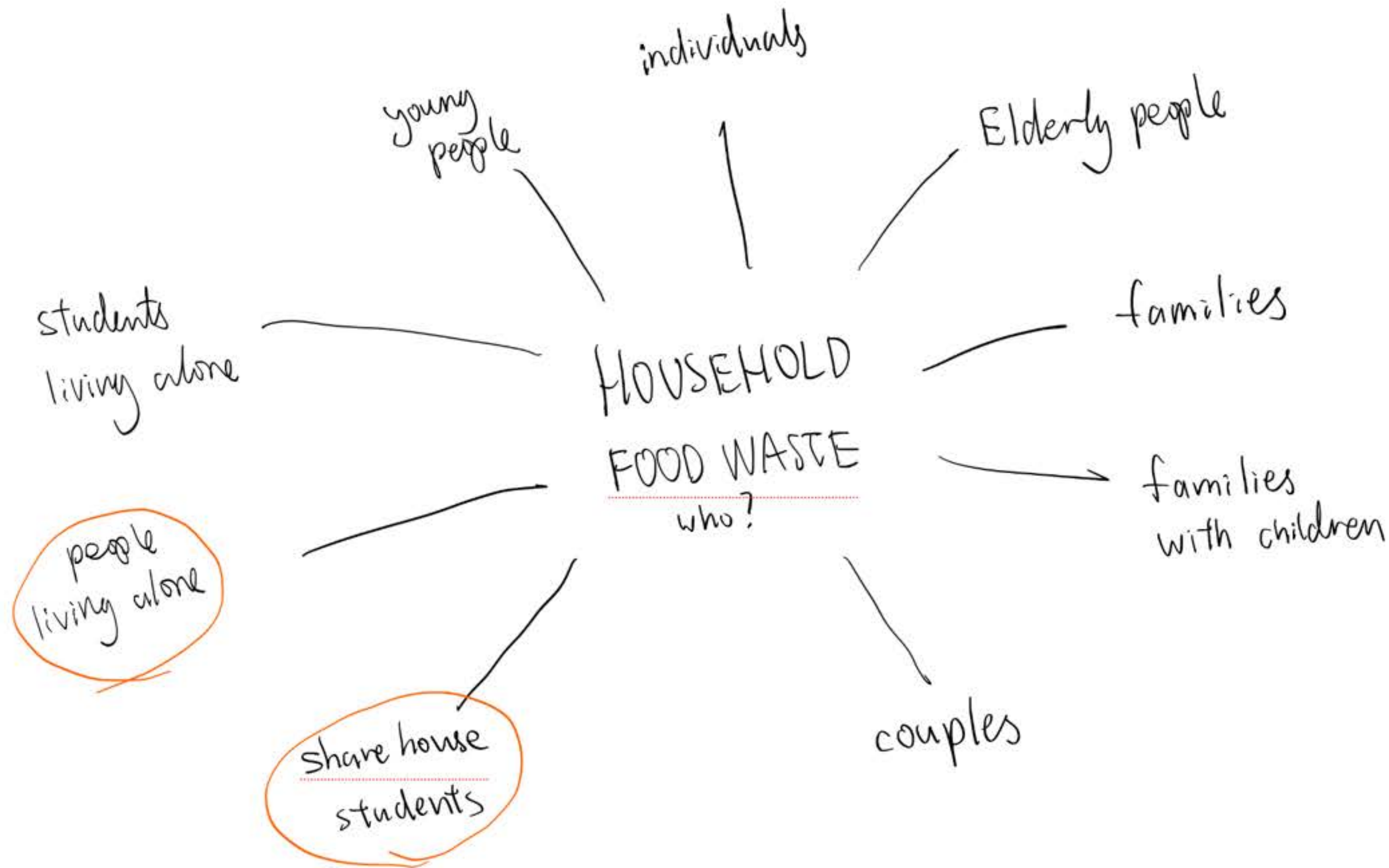


CAPSTONE PROJECT

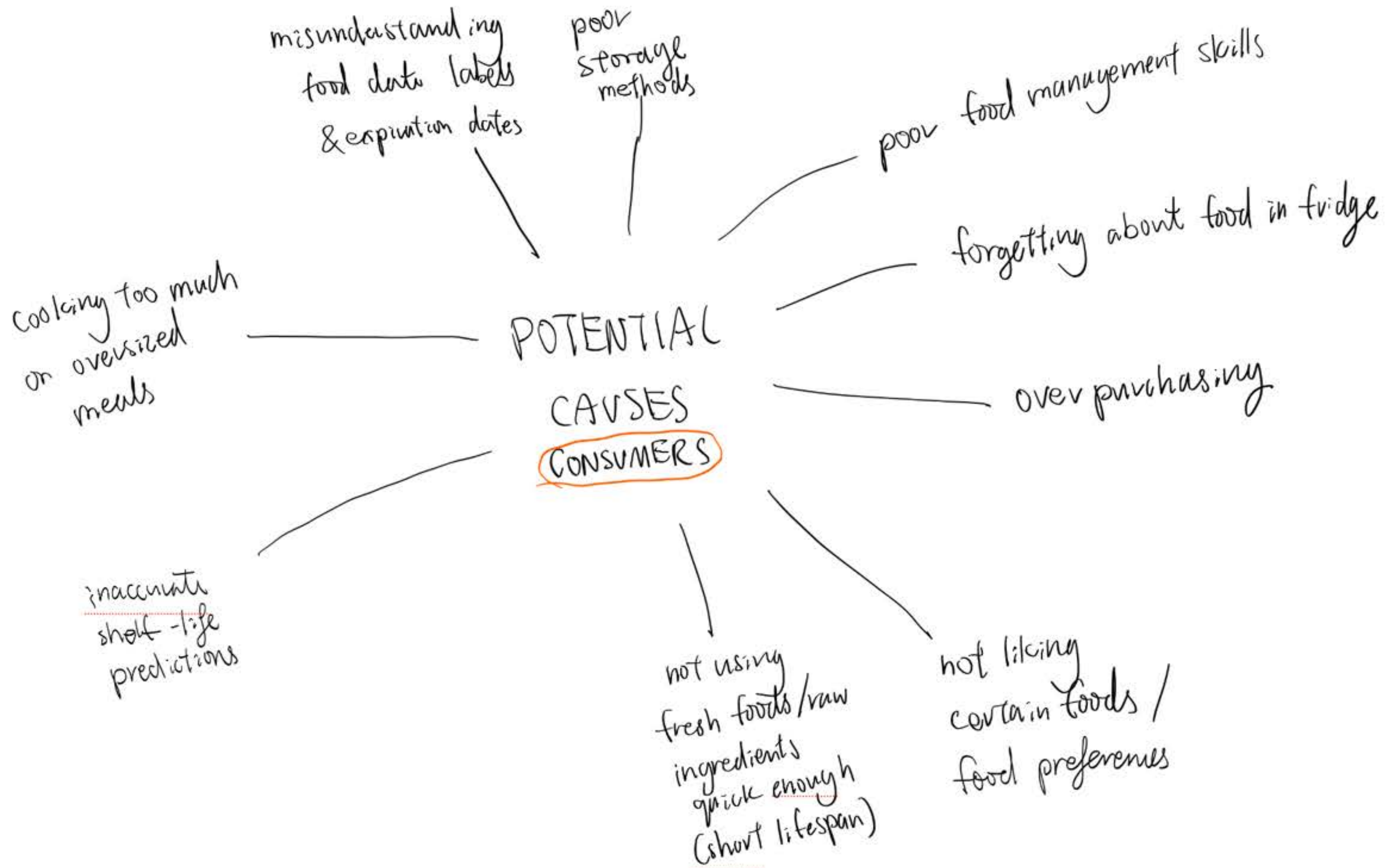
Quruli Moon Wright
n11302674
DNB311 2025
DDR





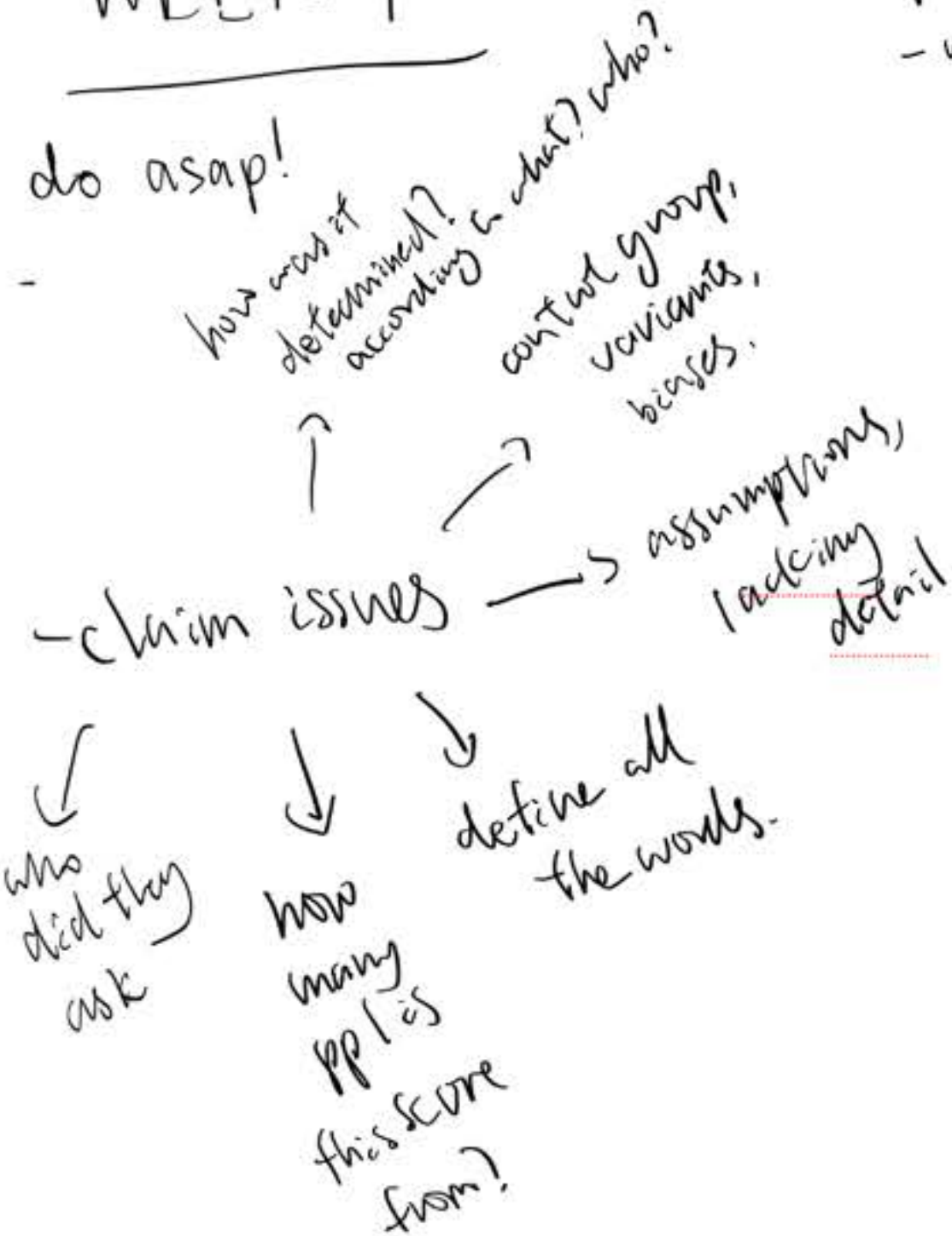
points of
interest/
potential
topic

do survey
+ then ask about
demographic to
find out problem!



WEEK 4

do asap!



potential Qs/intention/goal
- what do Elderly people do at this point

Survey data $\neq$ research
to make research, filter out what you need. what and why?
not all data/info may be relevant.

Research

- what am I actually interested in? (in 1 sentence)
 - context - time of day
 - age - problem/opportunity
- what are variables that might affect the experiments/results eg. public transport experience → weather → time of day.

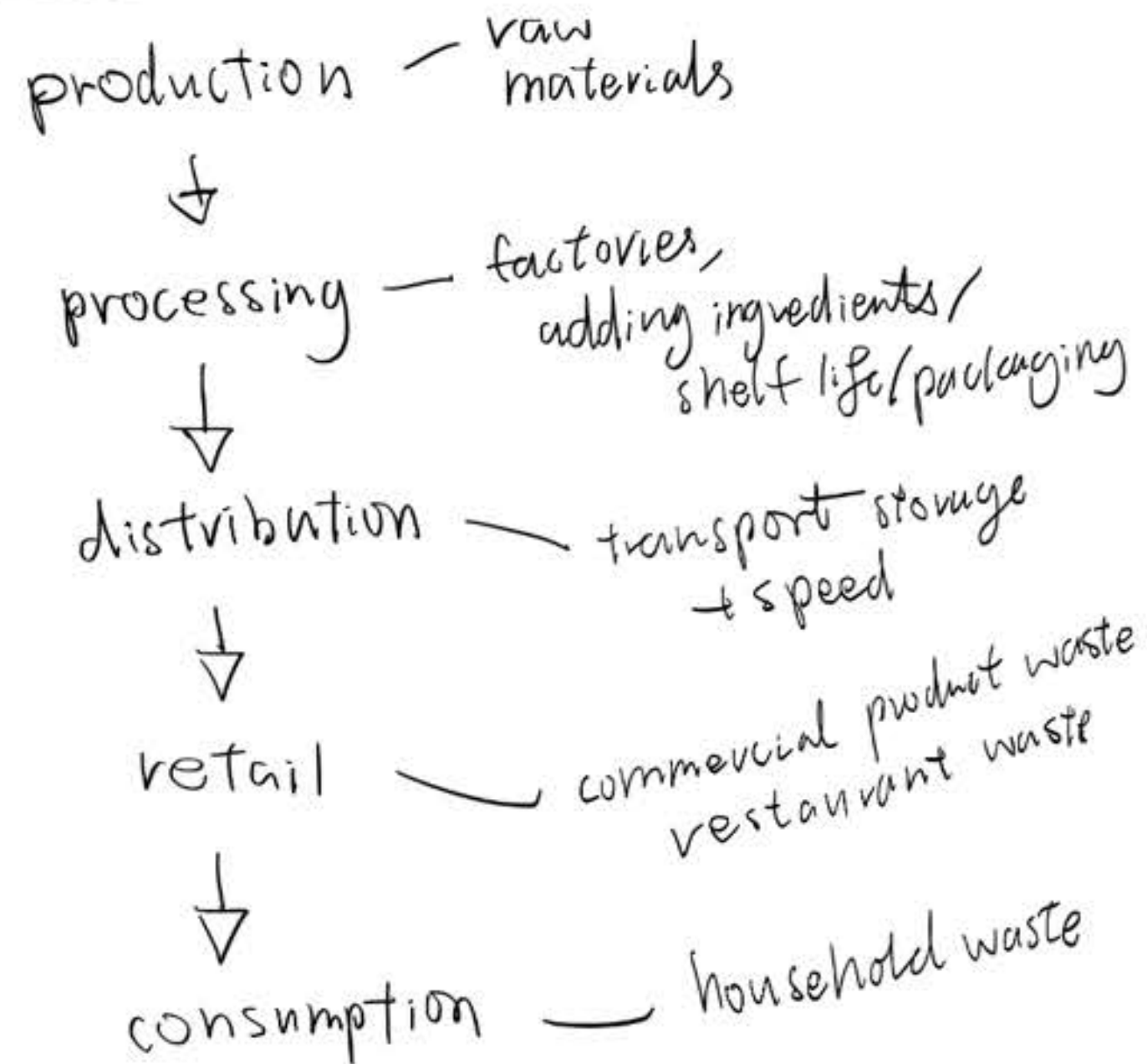
Quantitative

data collec. → analysis → findings → writing results

Qualitative



FOOD CYCLE



PEOPLE / CONTEXT

- household
- commercial / restaurants
- harvesting / agricultural waste or lack of tech

BENCHMARKING

ugly food
organisation

good to go
app

cold chain logistics

non
products

instant
recipe
recommendations
from mining
a single ingredient

free
access
public
fridge

turning
food into
fertiliser

make multiple
charts that
are relevant

food waste
recycling
tech

compost
systems

Smart food
packaging

Tetra Pak
carton
packaging

is it prevention?
or for after? - include
everything!
research broad
to be able to
identify
problem,
THEN, finally
target specific

Smart fridge

refrigerator

beeswax wraps or silicone lids
(replacing cling wrap)

freezer

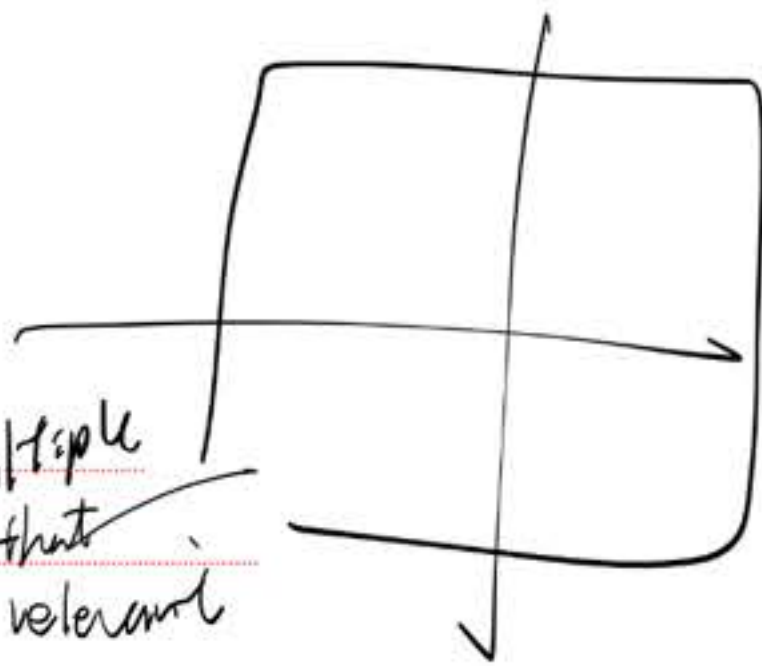
microbial sticker
that protects fruit

extends fresh fruit
life for up to 2 weeks!

tupper
ware

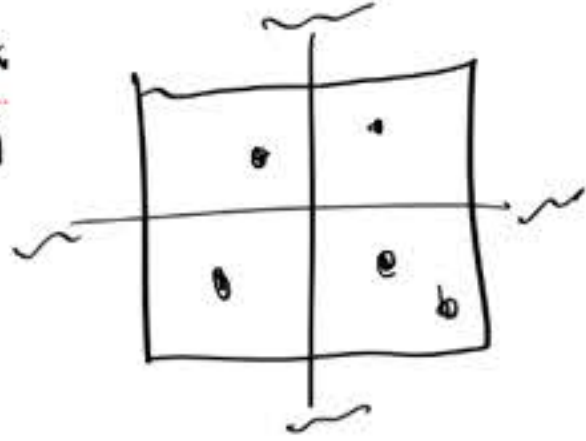
ethylene gas
absorbers
filters for
the fridge

esky



benchmarking methods

matrix
graph



radar /
spider
graph



table

c1	c2	c3	c4
	9		2
9		5	4
4		2	
			3
3			

PRODUCTS

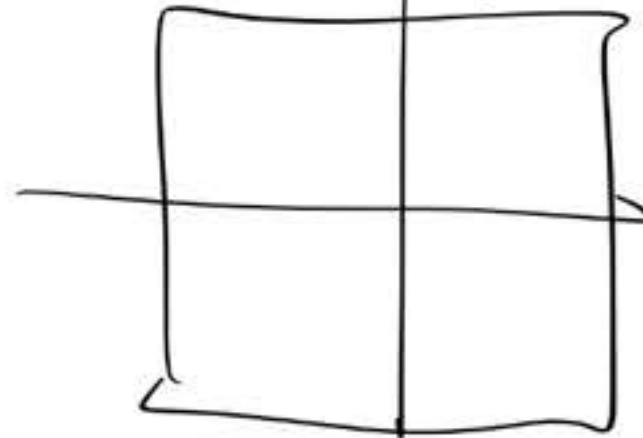
- tupperware containers
- fridge
- smart fridge
- freezer
- compost bin
- soil/food food recycling machine
- TetraPak carton beverage packaging
- beeswax wraps

- ghost monkey silicone fruit
tray covers
- STIXFRESH fruit stickers
- esky
- Fridge mate Purifie fridge filter/detoxifier

table

A large empty table with 5 columns and 6 rows, drawn with simple lines.

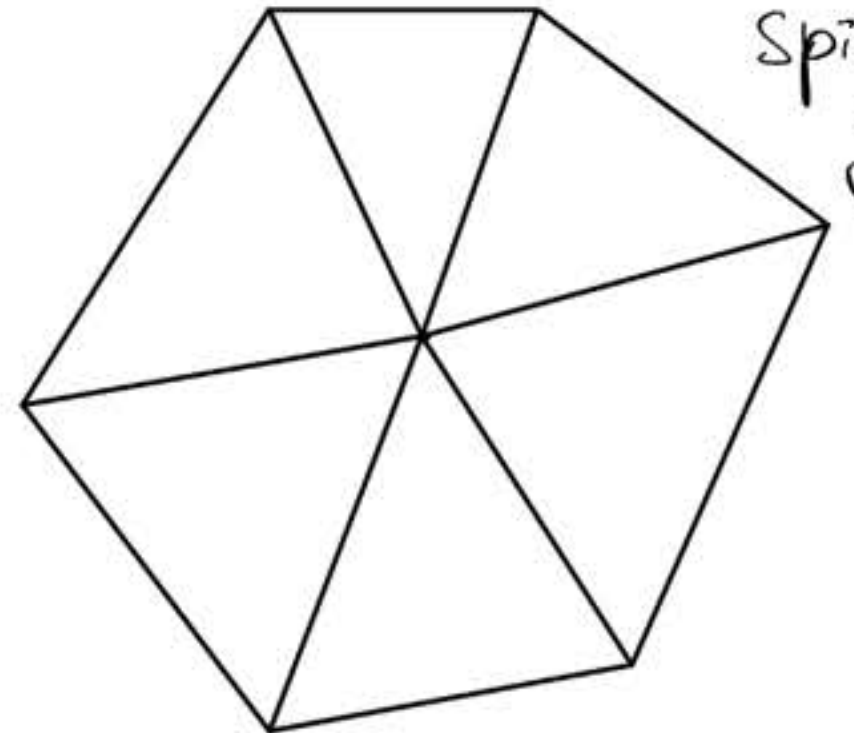
matrix
graph



NON PRODUCTS/ ORGANISATIONS

- too good to go app
- ugly food campaign
- cold chain logistics
- supercook
- Food 2 Soil (turns food into fertiliser/soil)
- Public fridge (free access)

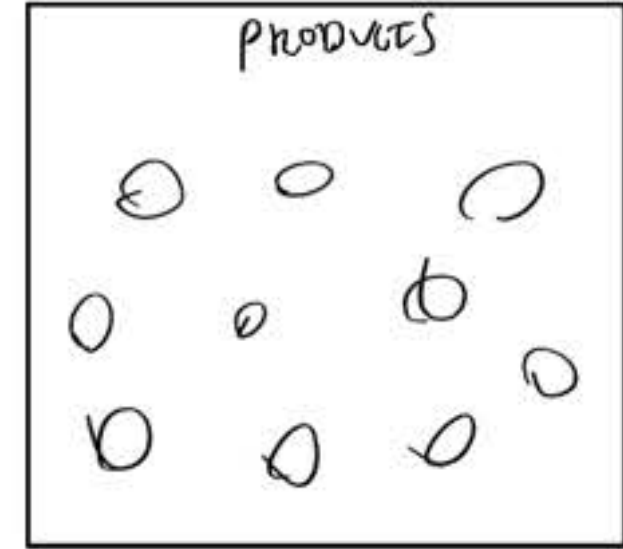
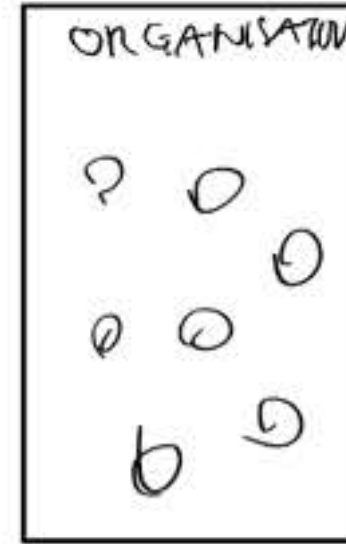
spider
graph



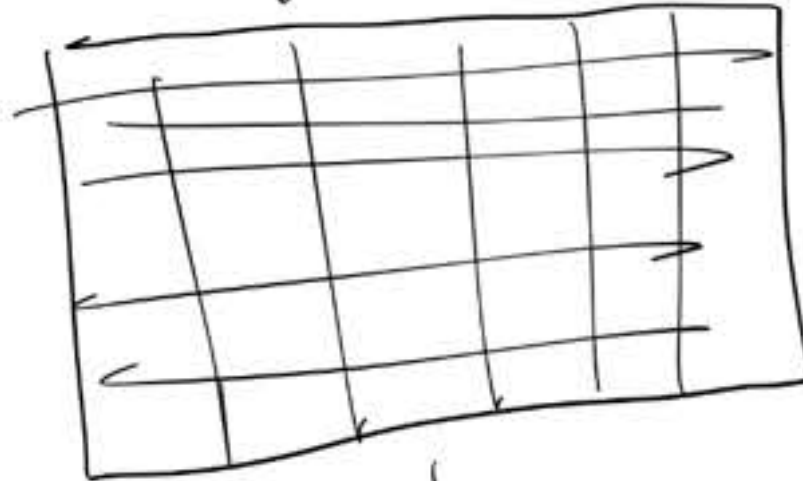
PAGE 1

- introduce what benchmarking is + the purpose of it.
- introduce found existing products + organisations —

organisation - radar

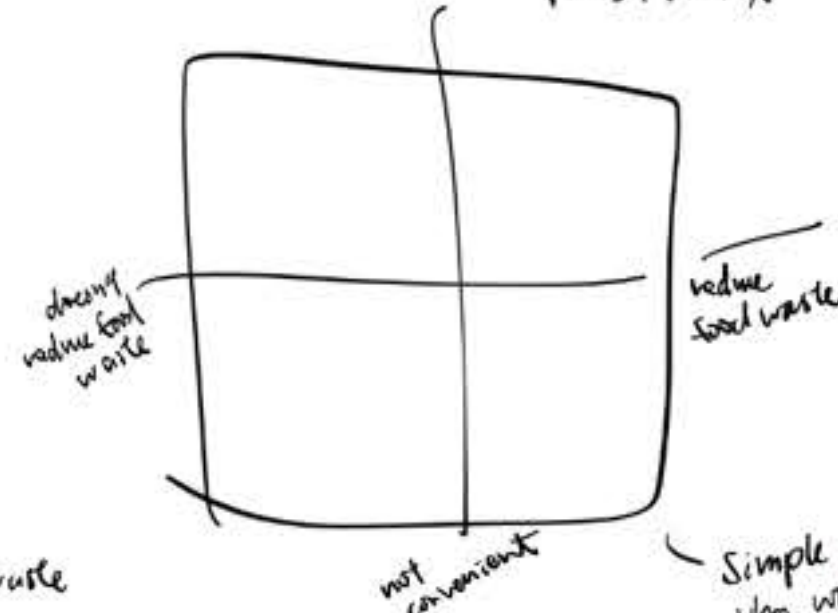


existing products



effectiveness in reducing food waste

convenient matrix



overall food waste reduction effectiveness

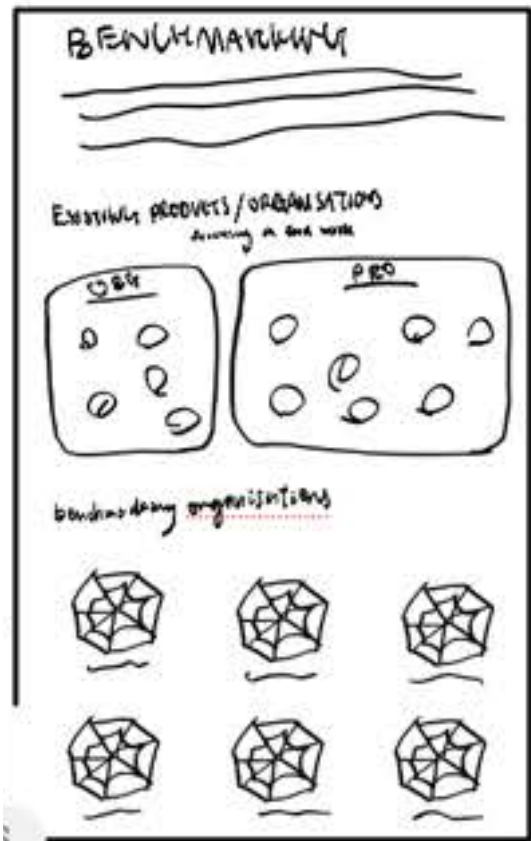
- user's willingness to use / incorporate into lifestyle
- affordability
- long term sustainability
- user engagement
- ⊖ convenience + user engagement

Simple sentence before this why was this chart necessary?
 To clearly see what's working, how showing results, seeing it's main purpose and most important convenience, effort, benefit individuals, high user engagement + awareness, long term sustainability

+ opportunities
 + gaps

pg-2

1~3 red 4~6 orange 7+ green



pg1.

ORGANISATIONS

Spider graph

- good to go
- The odd bunch
- food 2 soil
- supercook
- cold chain logistics
- community fridge

CRITERIA ELEMENTS

- effectiveness in reducing food waste in a commercial / retail context
- effectiveness in reducing food waste in a household context
- effectiveness in reframing food saving as a positive, sustainable practice rather than a stigmatised behaviour

- reduction of environmental impact
- accessibility & inclusivity
- user engagement
- affordability
- convenience & usability
- long-term sustainability
- stigma reduction

Interview

- ↳ household level → friends
- ↳ restaurants
- ↳ retail → coles,

- ↓
- what do you do w/ expired foods?
 - how do u try to combat this?
 - is it working?

Survey

- younger people (18 ~ 34)
- mostly working students or full time workers
- majority low income

Interviews

Civilians

Experts

o someone working

	Tupperware	Smart fridge	Freezer	Esky	Compost bin	Food recycling machine	TetraPak packaging	Beeswax wraps	Silicone food covers	StixFresh fruit stickers	Purifie
Effectiveness in Reducing Food Waste	6	7	10	6	7	9	8	7	9	8	8
Environmental Impact	6	5	5	7	8	9	7	8	8	9	9
Accessibility/ scalability	9	3	9	9	7	8	9	6	7	6	7
User engagement	10	6	9	4	7	6	6	8	8	7	6
Innovation level	4	8	2	3	7	9	9	6	7	8	7
Durability/ lifespan	8	6	6	8	8	8	8	6	9	7	6
Maintenance requirements	9	5	6	9	9	7	8	5	8	10	10
Affordability	9	2	6	9	6	7	8	7	7	6	8
Versatility	9	7	4	6	6	8	7	5	8	8	7
Long-term sustainability	10	5	5	10	9	8	7	7	8	9	8
Convenience	9	9	10	8	4	2	8	7	7	10	9
TOTAL /110	89	63	72	79	78	81	85	72	86	88	85

HOW TO ANALYSE MY SURVEY

- key questions - define clear purpose/ goal
- quantitative results + qualitative results.
- Likert scale / checkbox open ended / short answer

levels of measurement

- nominal / categorical

- ordinal

- interval

- ratio / continuous

- short answer

what's your favourite? →

—, —, —

ordered categories, what size do u like? →

S, M, L

ordered numerical data that scales →

identify & highlight / coding keywords.

convert to categorical data.

create report frequency of keywords.

- no of responses to each category

- collapse categories

- no of responses to each category

- collapse categories if appropriate

- use of response on a scale, percentages

- descriptors like → central tendency

mean - average

median - middle value

mode - most often

Interview

- Some things use up everyday
- main waste = customer waste
- 1 slice of toast
- 1 week of portion trial → their behaviour

Convenient

Doesn't reduce food waste

Reduces food waste

Inconvenient



WEEK 5 LECTURE

Research Report - due next Friday
3 Initial Ideas (presentation) - the following Friday

REPORT

add - word count, raw data in the appendix, AI use

2800
? 4000
(can go over 10%)

(bottom of cover pg)
exclude table, figures, graphs + references.

minimum word count

approx. 1pg = 400 ~ 450 words, size 10 ~ 12.

doesn't matter how many pgs, more the word limit.

(cover pg, ES, statements + table of contents not counted in word count)

raw transcriptions (& how it was coded)
note taking
affinity diagram
have + where have I used it? → reduce word count, improve wording, truncate + intensify

make the report

- neat
- clear
- attractive

academic background.

Sec 1. Intro, Background, Bench — 1 or 2pg.

Sec 2. Research, Analysis + Findings

Sec 3. Discussion, design implications, conclusion

Ref, Append.

in-text ref as well

include examples (most relevant) of surveys AS into appendix

what opportunities are there?

triangulation methodology, quali, quanti.

do not give meaning, no explaining! → so what did I find?
just report the findings

discussion = what does the data mean? for the design moving forward? How does it relate to the benchmarking?

getting marked on → relevant literature & benchmarking
clarity + sophistication of study
attractive & clear presentation

Initial concepts - due 12th Friday (AI pt 2)

- innovation, creativity, variety

- At least 5

- Spread 5 ideas → targets 5 different problem (various pain points/opportunities)
→ 5 different timelines (how realistic it is, futuristic)

- has to be very different ideas, not tweaked versions.

- AI cannot produce concept image (for final)

↓
AI - playing w materials, forms, colour variations.
- use it to stimulate ideas, not final presentation.

Complexity of initial concepts

- not too detailed, doesn't look like a final design. look conceptual.

- Simple background, clear features.

- may show process + steps, context.

- problem, solution, reasoning, features...

B block!

DATA ANALYSIS

1. get a sense of the whole - take notes
2. pick 1 doc + study in detail - write thoughts → how does this relate to my research Qs.
3. make list of topics that have arisen → cluster similar topics together
4. take codes + go back to data. new codes may arise.
5. find descriptions for topics and turn into categories
6. make a final decision

Rigorous

- systematic progress
- meticulous record keeping (evidence of analysis - post-it notes, photos, word doc)
- only relevant out of the 1 hr of data may be important. highlight + record what's important

bivariate analysis

SURVEY

1. nominal / categorical → what is ur fav brand?
- no order - different categories → how do u commute to work?
2. ordinal
- have order but distance between categories unknown → how often do u use the library?
□ 1x week
□ 2x week
□ 5x week
3. interval / ratio
- ordered + known distance → how much do u like ... ?
1. 2. 3. 4. 5.
→ how many - do u own?
□ antur.
4. central tendency

5. Sentence

- textual feedback
- count / report frequency of keywords
- identify keywords. (depending on context as it can be misleading)

describe your commute to work

PLANNING SURVEY

What key Qs am i investigating?

1. Who in the household is responsible for food buying, cooking, storing and disposing?
2. What behaviours lead to food waste (shopping habits, portioning, storage, leftovers, food safety decisions)?
3. Which foods are most commonly wasted and why (spoilage, taste, leftovers, date-label confusion, pests)?
4. What tools, appliances or routines do households already use to reduce waste (meal planning, leftovers, freezing, composting)?
5. What are the main barriers to waste-reducing behaviour (time, knowledge, space, cost, habits, social norms)?
6. What incentives or triggers would make people change behaviour or adopt a new product (cost savings, convenience, alerts, social proof)?
7. How does household context (size, ages, living situation, fridge/freezer capacity, work schedules, cooking skill) affect waste?
8. What attitudes and motivations (environmental concern, money-saving, health, aesthetics) predict interest in a new product?
9. What accessibility/physical constraints are important (mobility, vision, dexterity, small kitchens)?
10. What privacy/tech preferences matter (connected devices, data sharing, smartphone dependency)?

Basic/demographic Qs

1. I confirm that I am at least 18 years of age. I have read and understood the information provided about this survey. I understand that my participation is voluntary, and that my responses will be collected anonymously and used for research purposes. I may withdraw at any time before submitting the survey, and any data I provide will be stored securely.

yes/no

2. What is your age group?

- 18 - 24
- 25 - 30
- 31 - 38
- 39 - 50
- 51 - 64
- 65+

3. What is your current employment status? (Please select one)

- Student, not currently employed
- Student, employed on a casual or part-time basis
- Employed on a casual or part-time basis
- Employed full-time
- Unemployed
- Retired

4. What is your approx. annual income? (optional)

- <\$10000
- \$10k+
- \$18.3k+
- \$30k+
- \$50k+
- \$70k+
- \$100k+
- \$150k+

5. What is your suburb/postcode of residence? (optional)

open answer_____

3. Which of the following best describes your living situation?

- Living alone
- Living with partner / spouse (no children)
- Living with partner + children
- Living with children only
- Shared house / flatmates
- Multigenerational household
- Other (specify)

4. How many people are living in your household including yourself?

- just me
- 2
- 3
- 4
- 5
- 6+

5. Who is responsible for grocery shopping?

- everyone buys only for themselves
- everyone buys only for themselves but share food occasionally
- one/two members are responsible for everyone
- we take turns

6. How often is it done?

- daily
- multiple times a week
- 2x a week
- 1x a week
- every fortnight
- less than every fortnight

7. When buying ingredients or planning the next meal, do you have clear intentions or plans on what, when, and how you will be using/cooking/storing the ingredients, especially the perishable foods? Select all applicable.

- yes, I plan all my meals/meal prep so I am aware of what I have in the fridge and use everything efficiently
- I plan meals in bulk for meal prep to freeze until I consume them
- I plan sometimes but forget about some foods which eventually go bad
- I never plan and end up using the ingredients that I have access to as I plan my next meal on the spot
- other - please specify

Qs for research: what causes food waste?

- what is your age range?
- occupation → student, working full time, part time, unemployed, high school.
- living condition → living alone, with a partner, parents, sharehouse, with family.

- do you often end up with a fair bit of food waste at home?
whether it's yes or no, explain why.
- how often do you go grocery shopping?
 1. +3x week
 2. 2x week
 3. 1x week
 4. every fortnight
- about how much is your monthly spending on food approx?
don't include eating out, only groceries.

Potential Qs and answers

8. **Who** in the household is responsible for food buying, cooking, storing and disposing?

- everyone takes care of themselves
- we take turns
- its usually pretty unorganised
- it gets done because its done by whoever notices

9. What behaviours lead to food waste (shopping habits, portioning, storage, leftovers, food safety decisions)?

10. **Approximately** how much worth of food/groceries do you think is wasted on a weekly basis?

- <\$10
- \$10+
- \$20+
- \$30+
- \$50+
- >\$100

11. **Which** foods are most commonly wasted in your household? (including everyone’s) Select all applicable.

- category options - Fresh vegetables
- Fresh fruit
- Dairy (milk, cheese, yoghurt)
- Meat / fish
- Cooked leftovers
- Bread / bakery items
- Packaged food past "best before"
- Other (text) - please specify _____

12. **why** do you think this happens? Select all applicable.

- Lack of time
- Lack of education/knowledge or confusion about date labels (use by / best before)
- No financial constraints or worries
- Spoiled before use
- Leftovers not eaten
- Bought too much / bulk buying
- Food got damaged / pests
- Didn’t like taste
- Too much time required to use / preserve
- It’s not really a priority for me
- Other (please specify)

13. **What** tools, appliances or routines do you or anyone in your household use to reduce waste? Select all applicable.

- meal planning
- leftovers
- freezing
- composting
- having a food budget
- being mindful about purchasing more than necessary
- other (please specify _____)

14. What are the main barriers that leads to waste-reducing behaviour that may apply to you or others in your household? Please explain.

(eg. time, knowledge, space, cost, habits, social norms)

open answer

15. How confident are you in knowing whether food is still safe to eat?

(1 – Not at all to 5 – Very confident) (1–5 Likert)

16. How much do you agree: “Reducing food waste is important to me.”

(1 Strongly disagree – 5 Strongly agree)

17. What is the single biggest annoyance you have with food storage, leftovers, or waste?

open answer_____

18. What is your biggest motivator encouraging you to reduce food waste?

- Save money
- Environmental concern
- Improve household organisation / convenience
- Health / food safety
- Social pressure / image
- Other (specify)

Is there anything you wish existed in the current world which could help you become better at saving food? (mention anything, even if its unrealistic or might not be possible!)

How does household context (size, ages, living situation, fridge/freezer capacity, work schedules, cooking skill) affect waste?

What attitudes and motivations (environmental concern, money-saving, health, aesthetics) predict interest in a new product?

What accessibility/physical constraints are important (mobility, vision, dexterity, small kitchens)?

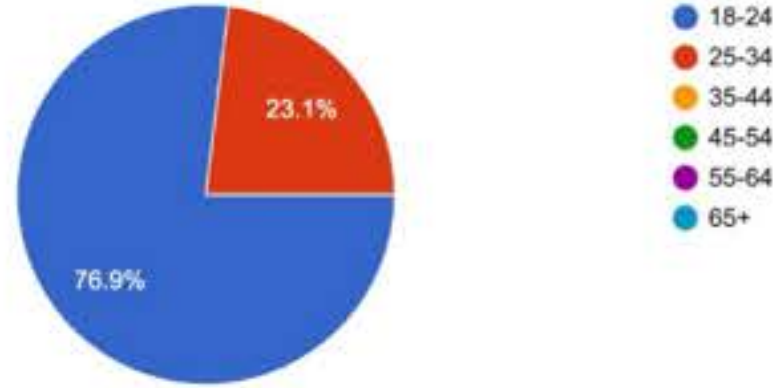
What privacy/tech preferences matter (connected devices, data sharing, smartphone dependency)?

What is something that you can think of that may minimise or prevent you from wasting food (mention it even if it sounds unrealistic! anything)

Q1. What age group do you fit into?

52 responses

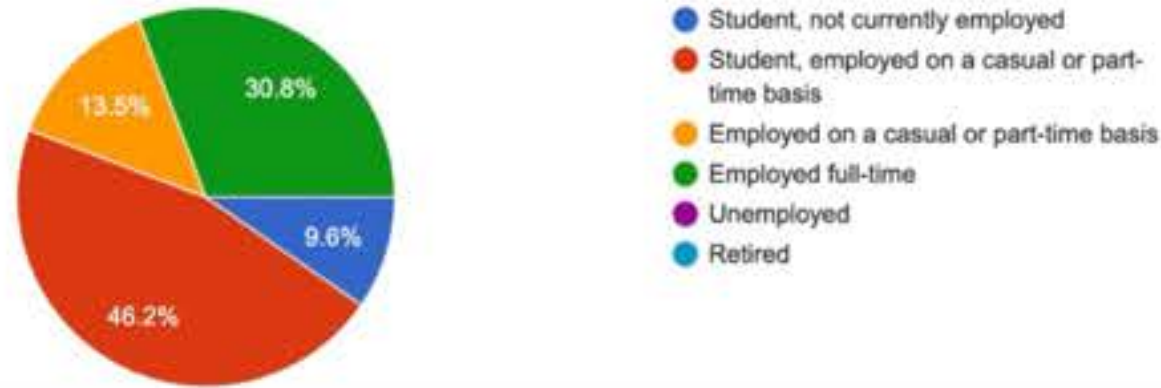
[Copy chart](#)



Q2. What best describes your current employment status?

52 responses

[Copy chart](#)



majority
77% 18 ~ 24 - young people

minority - 25 ~ 34

therefore this report
targets younger people

47% employed students
31% employed full-time

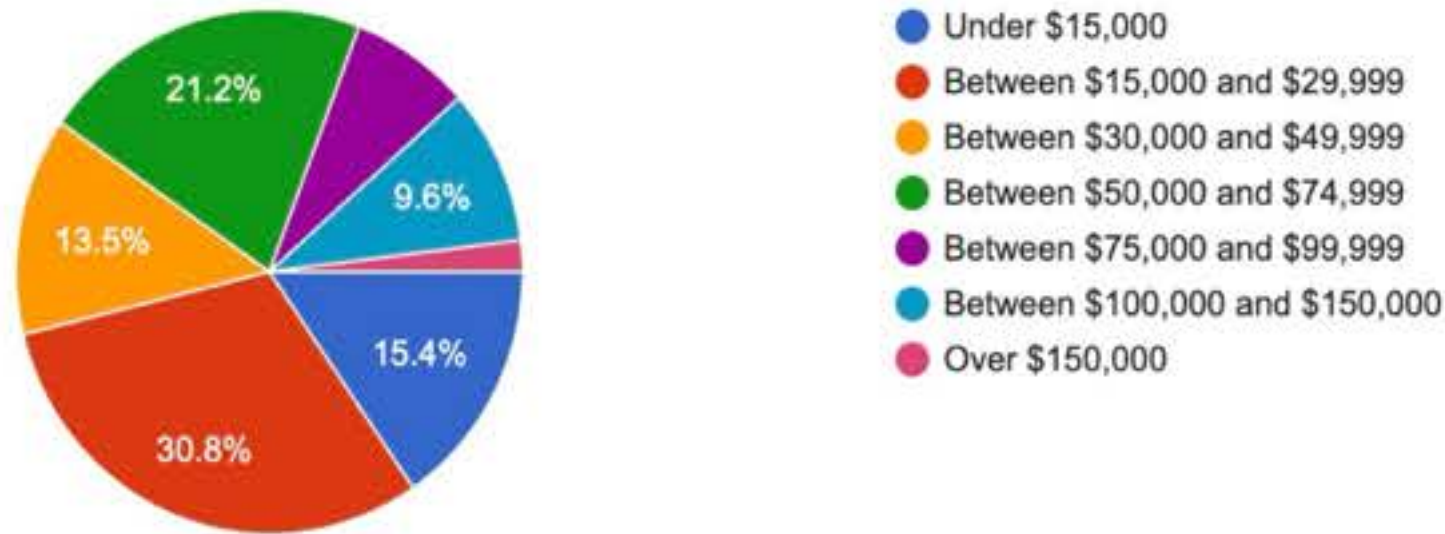
or
employed casually
/ unemployed student.

mostly students,
working = very
busy, stressed
and most likely
does not prioritise
reducing food waste
much unless it directly
affects them individually
e.g. losing money

Q3. What is your approx. annual income? (optional)

52 responses

 Copy chart



majority (31%) - \$15k ~ \$29k ^{low income.}
21% - \$50k ~ \$75k
15% - under \$15k
14% - \$30k ~ \$49

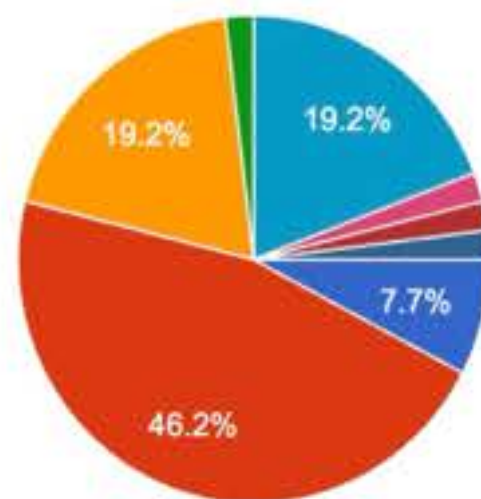
↓
46% of the 52 respondents
are very low income → wasting food = losing money
therefore they care enough as
it directly affects them

ON THE OTHER HAND → the other half of respondents have higher incomes,
indicating they're more likely to be working more / harder = more money
but less time. = less time to prioritise reducing waste + more income = food is abundant,
not really their concern.

Q5. Which of the following best describes your living situation?

52 responses

 Copy chart



- Living alone
- Living with parents / family members
- Living with partner / spouse (no children)
- Living with partner + children
- Living with children only
- Shared house / flatmates
- Multigenerational household
- House sitting/jumping

▲ 1/2 ▼

majority living with family or partner (65.4%)

likely dependent on parents or other family members for food + groceries (food waste may not concern them as much because they have less financial responsibility on constraints)

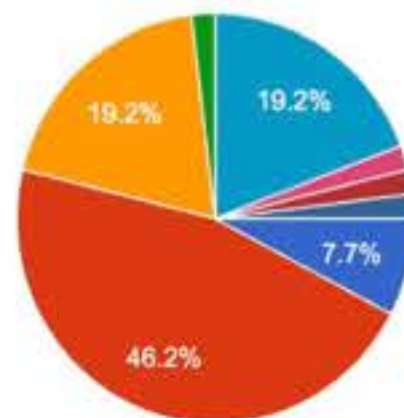
living alone / sharehouse (26.9%)

must be more independent + mindful in terms of their lifestyle or money.

Q5. Which of the following best describes your living situation?

52 responses

 Copy chart



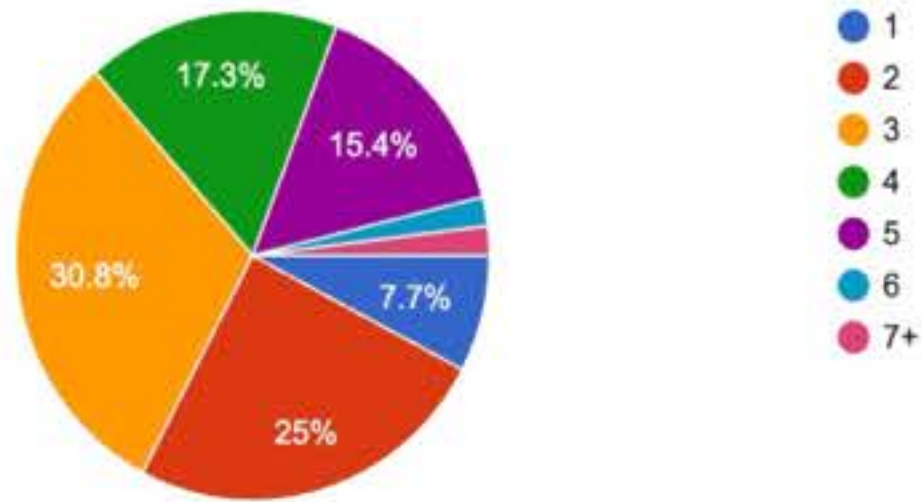
- 70% with parents, 30% with Tom
- Caring for Parents

▲ 2/2 ▼

Q6. How many people are living in your household including yourself?

52 responses

 [Copy chart](#)



households with 1 person are very low, most choices are quite even - could indicate families, could indicate sharehouse members.

mode - 3 people

Q7. Who is responsible for grocery shopping in your household?

52 responses

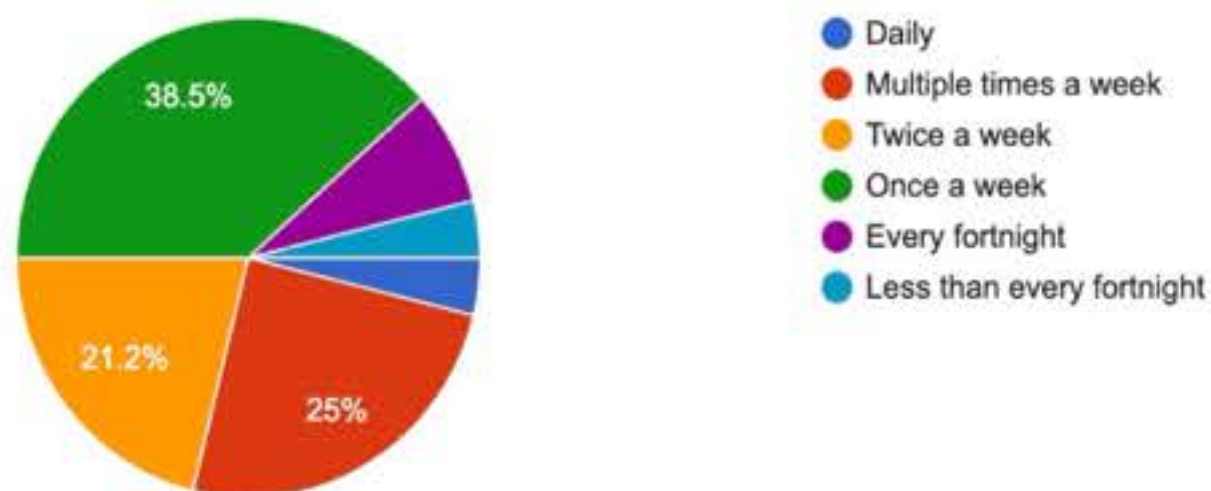
[Copy chart](#)



Q8. How often is it done?

52 responses

[Copy chart](#)

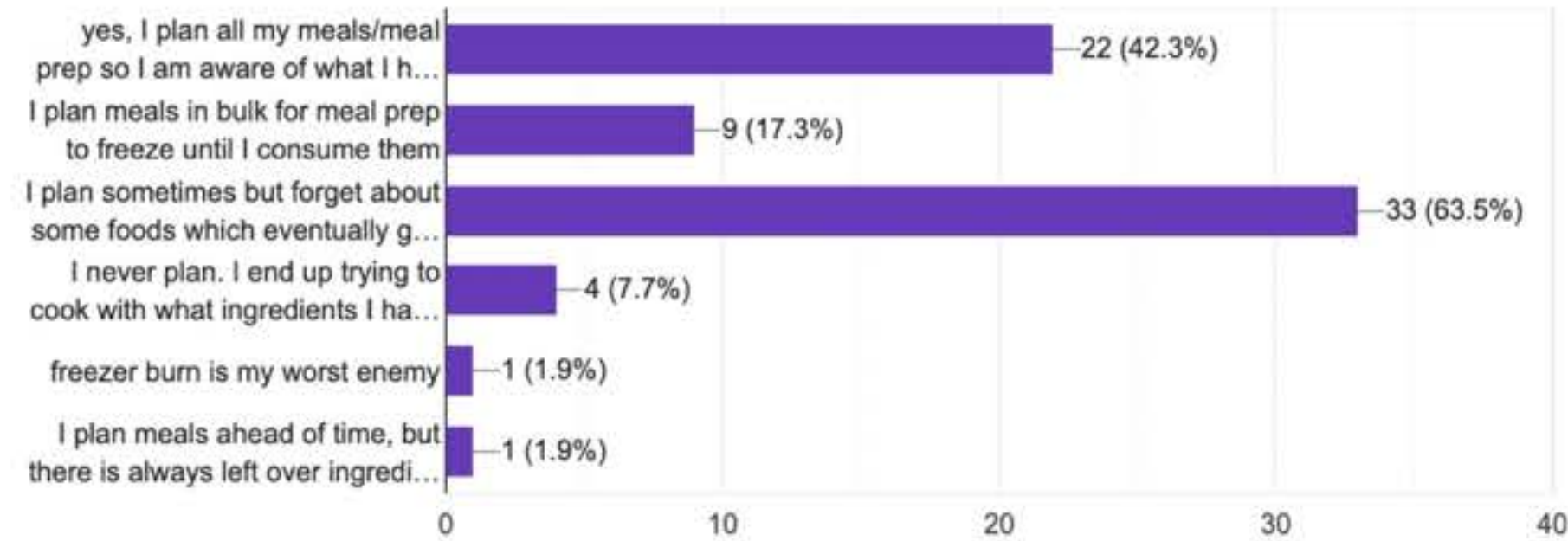


around 60% of respondents
go grocery shopping more than
1x week = they could be buying
food more than they need
+ forgetting what they already
have stored in their fridge,
freezer + pantry.

Q9. When buying ingredients or planning the next meal, do you have clear intentions or plans on what, when, and how you will be using/cooking/storing the ingredients, especially the perishable foods? Select all applicable.

 Copy chart

52 responses



- forgetfulness
- freezer burn
- leftover ingredients

(likely to be someone living alone or not sharing foods in a sharehouse)

most people plan but struggle to follow through or stick to it. (consistency)

↓ good intentions but "forgetfulness" is a big keyword

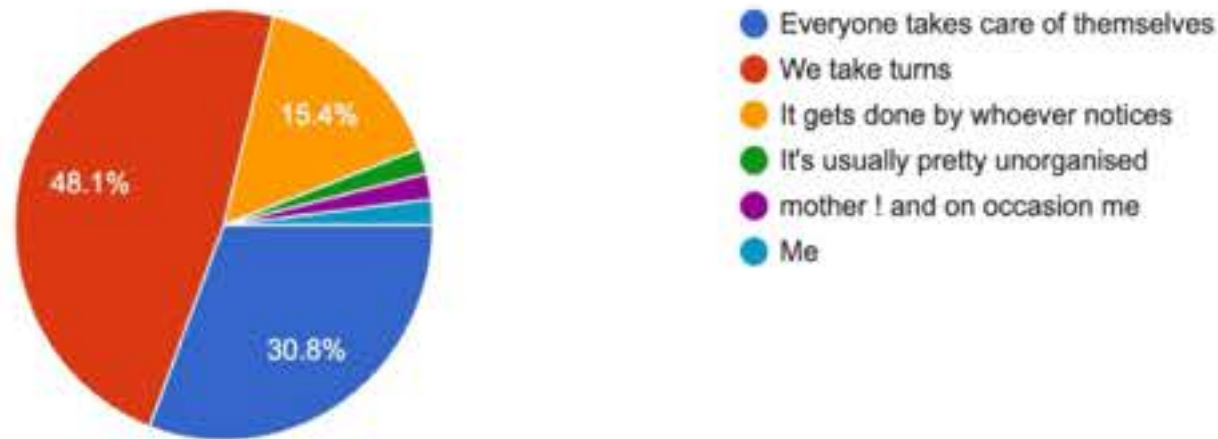
most people have figured out bulk/freezer method is effective for not causing food waste.

a respondent mentioned → I plan but can never fully use up leftover ingredients in time' indicating = planning isn't reliable 100% for 100% of people.

Q10. Who in the household is responsible for food buying, cooking, storing and disposing?

52 responses

[Copy chart](#)



majority - 'we take turns' = groceries may be inconsistent, not tracked each time, leaving the one buying not being aware of what needs to be bought, and what doesn't. miscommunication.

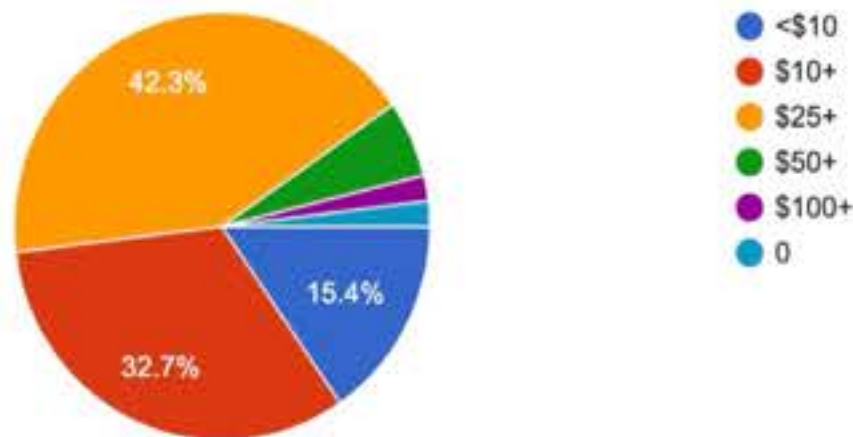
31% - everyone takes care of themselves (if not in a sharehouse context) → may cause duplicates of food = there wasting unused food.

→ communication method, reminders etc.
organisation. tracking tools, smart storage systems.

Q11. Approximately how much grocery money might be going down the drain every week in your household due to food waste?

52 responses

[Copy chart](#)



At least 75% of households are losing at least \$10 per week.

minority → 5.8% report \$50 or \$100 losses

↳ may be bigger households, more frequent shopping + less effective storage & communication.

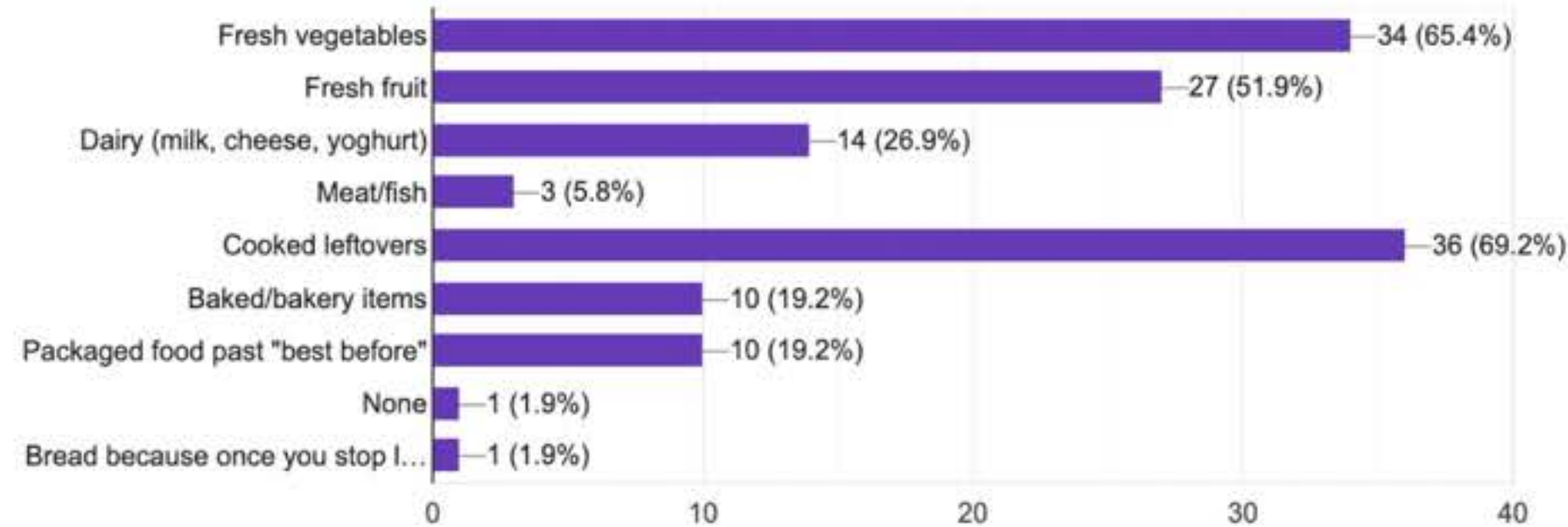
key meaning → most households are directly impacted by food waste therefore have a reason to be motivated to reduce this issue. → saving money

Studies also show that perceived/ self-reported waste is lower than reality usually = the losses can be predicted to be higher.

Q12. Which foods are most commonly wasted in your household? (including everyone's) Select all applicable.

 Copy chart

52 responses



majority
fresh veg + fruit wasted
= short lifespan, not being organised enough,
lack of planning + running out of time,
improper storage.

majority
cooked leftovers wasted
= cooking + buying too much, disorganised & overestimate
portions + communication problems (assuming others will eat it
but they don't)

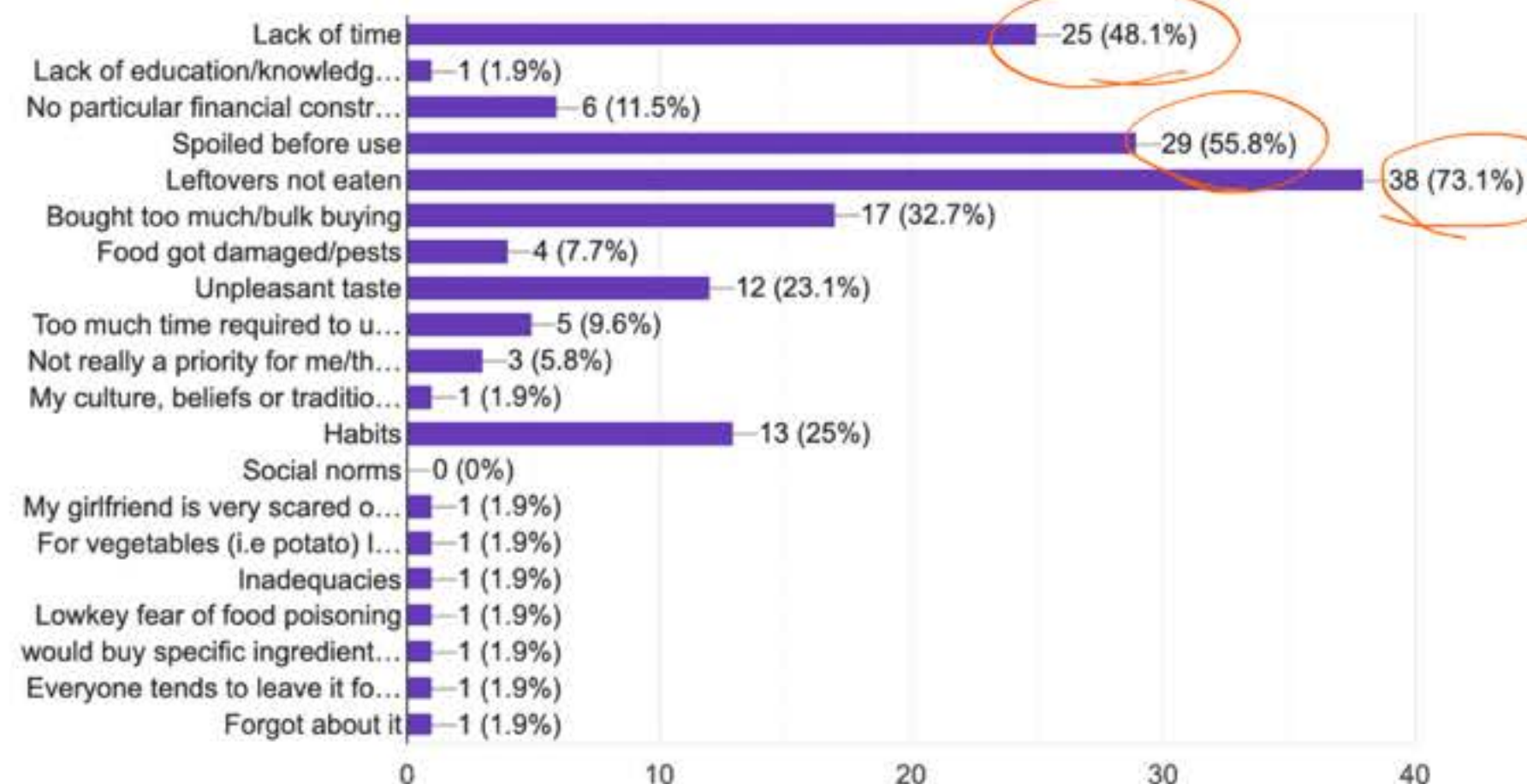
baked / bakery items
= goes mouldy too quick
(most people can't too sure
how to properly store)

past best before date
= misunderstanding labels,
don't want to take risks,
unsure or won't bother
checking if it's still fresh enough.
& forgetting until the point the
food "expires"

Q13. What are the main barriers that leads to waste-reducing behaviour that may apply to you or others in your household? Select all applicable or explain.

 Copy chart

52 responses



main reasons that leads to food wasting behaviour



73% - leftovers not eaten → after cooking → ^{cooking too much} don't want to repeat meals
 56% - spoiled before use → poor planning, overbuying, forgetting
 48% - lack of time → takes time + effort → look out for convenience, busy lifestyles, low priority!

other less significant barriers



- buying habits → buying too much, promotions, bulk-buying
- taste preferences & not enjoying/getting sick of same food.
- storing & after purchase habits → routines, not checking fridge...
- specific, individual barriers → pests, food safety concerns, tradition

behaviour

lifestyle

habits, patterns + forgetfulness

therefore



low concern or priority

not enough time.
(too much effort)

convenient tools to

fit in w busy lifestyles

- easy, effortless + effective
- suit lifestyle = sustainable long term
- on the go organisation
- reminder systems for busy people

To combat /mitigate /provide a solution to these identified painpoints

↓
spoilage prevention

- smart storage /way to extend food shelf life.
- visibility in fridge /storage/organisation
- something to increase a sense of urgency

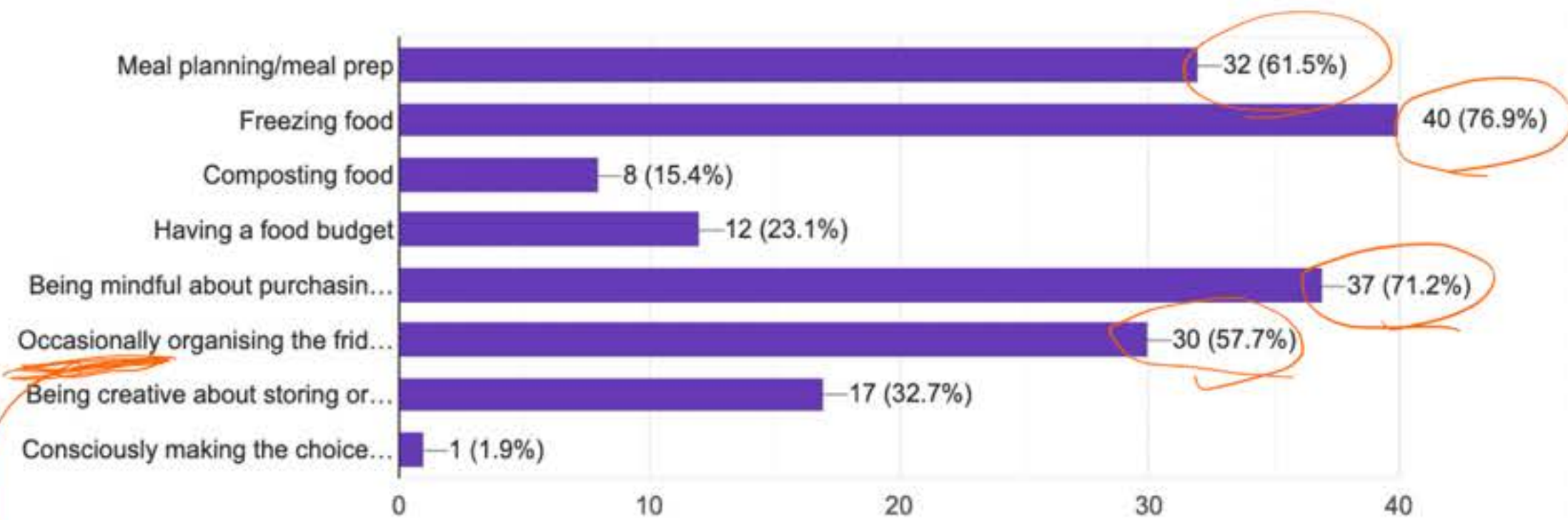
↓
leftover management

- reminder to use asap
- better storage

Q14. What tools, appliances or routines do you or anyone in your household use to reduce waste? Select all applicable.

 Copy chart

52 responses



Suggests people recognise the importance of maintaining organisation but "occasional" is not enough to solve the evident problem.

main findings

- people are conscious of food waste + is putting some effort to reduce this BUT stats still indicate it's not fully solving the problem enough.
- intention $\neq$ outcome. (if the solution was convenient + not unaffordable, people would most likely be willing to adapt to new methods)



Solution

top barrier
= lack of time

convenient + requires minimal effort

encourages consistency (for long term sustainability)

easy + consistent organisation

- easy
- consistent
- effective
- affordable (in terms of money + time constraints)

WHAT PEOPLE rely on the most

77% - freezing food

- super convenient + effortless
- lasts months or years
- not everything can be stored in freezer (compromises food quality)

trusted

widely accessible tool

71% - mindfulness / not buying more than necessary

- usually root of problem + should be focused on more
- impulse buying habits + poor planning = food waste!
- motivation to save money + maintain food lifestyle organisation

62% - meal planning / prep

- good habits + food saving consciousness
- organisation + convenience after the effort of planning.

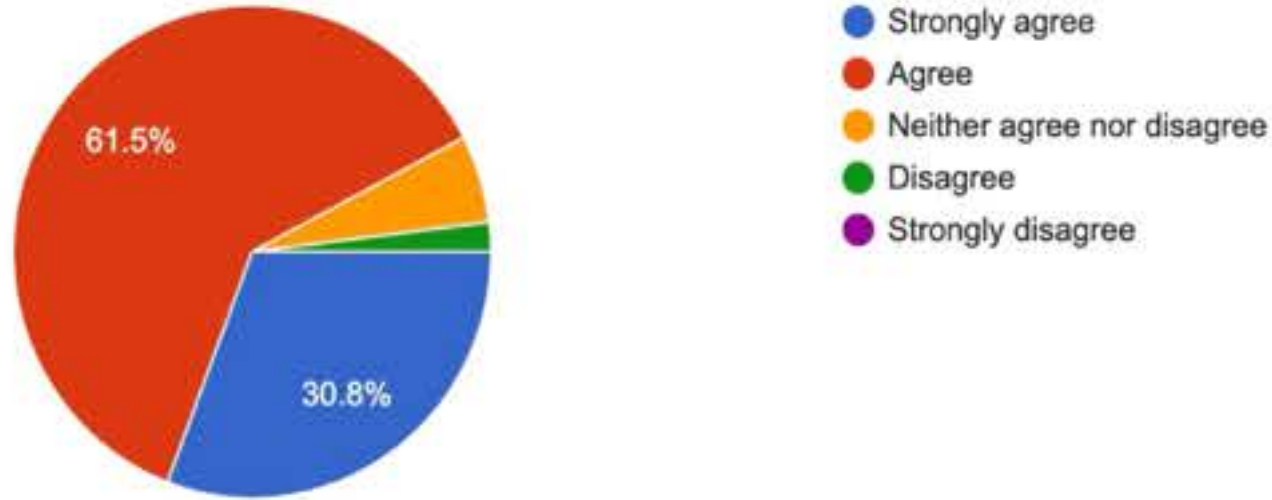
conscious of food waste HOWEVER statistics still show overbuying + spoilage as main barriers = intention

food waste is unintentional $\neq$ outcome

Q15. How much do you agree with this statement: "Reducing food waste is important to me."

52 responses

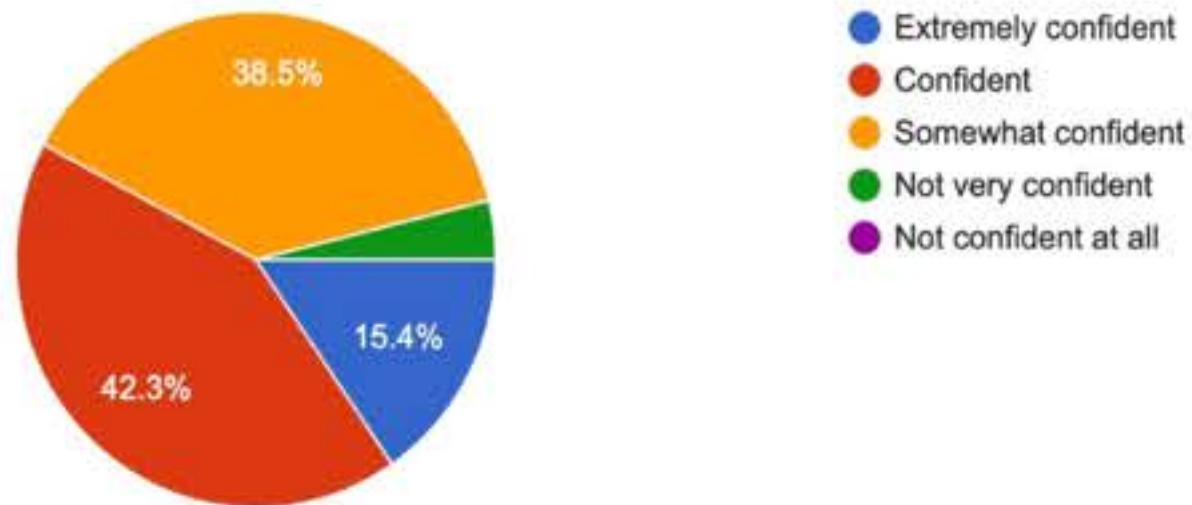
 Copy chart



Q16. How confident are you in knowing whether food is still safe to eat?

52 responses

 Copy chart



92% of respondents agree or STRONGLY agree that "reducing food waste is important" to them, personally.

Therefore intention $\neq$ outcome, but with the statistics consistently reporting high levels of food waste, this means, good intentions is not enough.

It requires more planning, effort & needs to be higher priority to effectively make changes in mindsets/habits.

Only about half of the respondents are confident in being able to determine if certain foods are fresh enough / safe for consumption

↙
opportunity → a product that

- determines food safety
- provides better food education (on exp. dates or best before date differentiation etc)
- makes compost an easy option if person determines it's unsafe or is unsure.

Q17. What is the single biggest annoyance you have with food storage, leftovers, or waste?

52 responses



CATEGORISING MOST COMMONLY MENTIONED CLAIMS

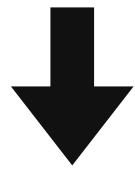
- forgetting
- laziness / low priority for food planning / organisation
- concerns with short food lifespans
- lack of knowledge
- shared fridge problems

BIGGEST ANNOYANCE W/ FOOD STORAGE, LEFTOVERS OR WASTE?



frequency of keywords used (main pain points)

- x9 forgetting
- x11 laziness / disorganised
- x14 short food lifespan
- x6 lack of knowledge / education
- x3 shared fridge problems / lack of storage space



out of the 52 responses

- 27% reported short food lifespan
- 21% reported laziness/disorganisation
- 17% reported forgetfulness
- 12% reported lack of knowledge
- 6% reported lack of storage space

It feels like you are throwing money down the drain for no reason

Time to prepare such as preparing vegetables

Food storage or Leftovers - people in the household tend to eat out when there's food at home, leading to more waste than necessary.

When stuff goes off

Freezer burn

not knowing the best/smartest ways or hacks to keep fresh foods fresh as long as possible OR not knowing how or what to cook with certain ingredients and accidentally leaving them til they rot

Have not figured out how to store some veggies and fruits, all my carrots go bad before use. So maybe it takes a lot of storage to store food properly.

To plan meals meticulously ahead of buying groceries.

Once I notice it's mouldy it's too late to use it

smell

I keep forgetting I have food in the fridge and buy take aways

You wait for an occasion to eat something and then it goes off before that occasion actually happens

Leftovers

feels bad to do

Loss of refrigerator space

Vegetables go bad faster than I expect

Not wanting to consume leftovers anymore/dispose of it improperly

when leftovers are too little feeling unmotivated to store it so you just chuck it out. food storage solutions on the market arent good either.

Not sure

Good preparation and pantry/fridge organisation

Woolworths only does use by on fresh produce up to a week so your forced to consume perishables asap, for example if we go shopping on the 16th, the latest date we can find is the 22nd. So you end up wasting food if you're not noticing what you purchased.

How quick it goes out of date e.g leftovers

shared fridge - lack of storage

how fast stuff goes bad lol

Food going off before it's used :/

Lack of mindfulness from other family members (1 person bulk buying and meal prepping, other family members not eating leftovers)

Goes bad before use or forget about it

Unsure

Having to throw out food means money wasted

Not wanting to repeat meals

It can go liquidy and then the appearance makes me not want to eat it

Laziness

When you were excited to eat the fresh fruit but it tastes off so you have to throw it away

The taste of the food/boredom

Can get repetitive if having to eat same leftover continuously.

That I never know how much food to put aside with leftovers. Always too much or too little leftover causing waste.

If I don't see it I forget it's there and it gets spoiled

Probably not knowing exactly when packaged food is still okay if past best before dates

Some must be used within days, so you have to really plan your meals with that in thought and even so, sometimes they still go bad before you are ready to use the. Example, Avocados.

Housemates not eating leftovers

Annoyed because I forget I have stuff and don't end up using it till it's off

Easy to forget

I forget sometimes what I have in the fridge and by the time I remember it's gone off (my food gets hidden in the fridge)

That vegetables go moldy fast in fridge

Items going mouldy

Leftovers going bad too quickly

Wasting money

How quickly something can go off. Broccolini and asparagus do not last more than 24 hours before going bad

I wanna eat out all the time then my food gets bad

Not knowing if it's safe to eat

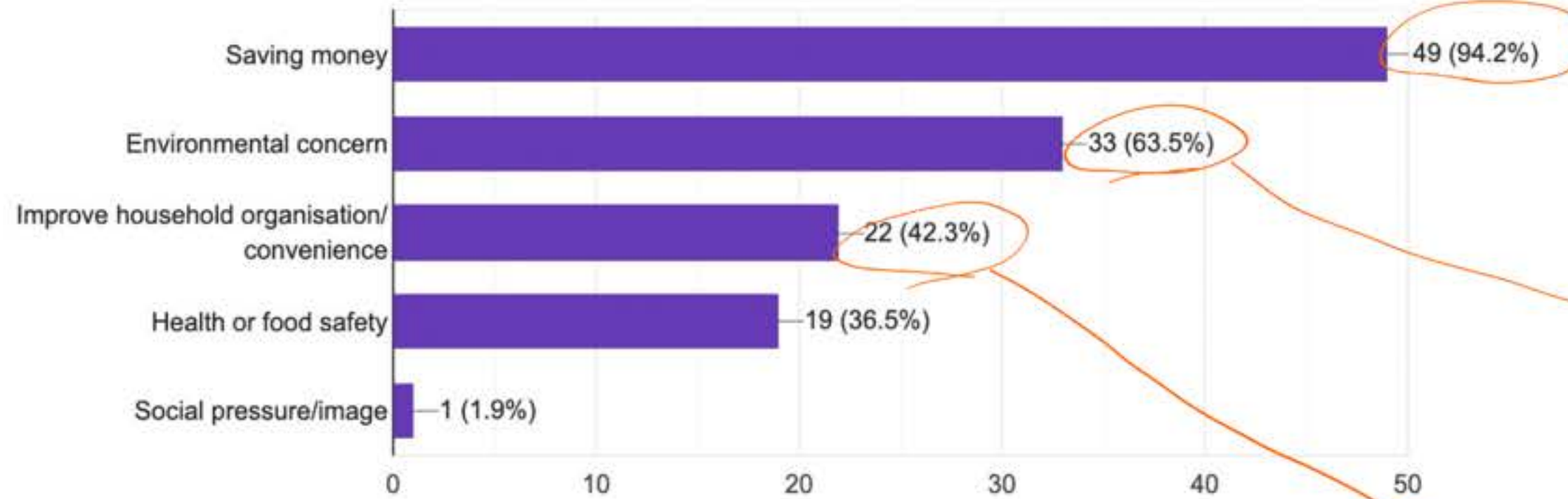
Not being eaten in time.

Using leftover ingredients

Q18. What is your biggest motivator encouraging you to reduce food waste?
Select all applicable.

52 responses

 Copy chart



94% - saving money

↓
biggest motivation for almost everyone is for individual, personal gain/benefit

↓ (other parts of survey + interviews have consistently reported this)

64% - more than half of respondents have concerns for the planet as well

42% - just less than half of respondents are motivated by their long term organisation and convenience → reducing food waste benefits them not only financially but

↓
- less stressful
- less effort long term if meals + budget has been pre-planned
- convenient + doesn't require much effort that they can focus on their busy life, other chores and things higher in their priority list
- being organised with food = higher quality of life
- sense of organisation and fulfilment in terms of being able to take care of their health + wellbeing

physical + mental health

- encourages organisation with minimal effort.
- not harmful for the environment = doesn't compromise on the state of the environment or nature
- allows easy determination of how safe the food is / or encourages/reminds user to use up food before the dates become a concern.

THIS INDICATES people will be more motivated + inclined to use a product

- ↓
- convenient
 - saves money + time
 - adaptable + accessible
 - effective in reducing food waste (serving it's main purpose!)

Q19. Is there anything you wish existed in the current world which could help you become better at minimising food waste? (mention anything, even if its unrealistic or might not be possible! No right or wrong answer)

52 responses



product that extends food lifespan

Easy sharing of food to those in need / or capable of using up in time

Compost / recycle food (adaptation / post food waste)

Education for food perspective (which impacts habits, behaviour & level of effort)

Better access to foods discarded / don't even make it to retail

Better food transportation (eg. speed, access, storage quality)

Effort / time saving products / reminders

Saves money

Better household food storage

A way to make dairy products last longer without additives or freezing. Some sort of space (like a crisper) that rotates the products so they last longer without being frozen over. Specially cheeses and dips

Smaller portions

magical portal

Food recycling composting machine

→ Easily compost uneaten food and use it in your vegetable garden

A refrigerator that keeps vegetables fresh longer

If more education was taught on it and how to consciously be aware of waste, appreciating and having gratitude for food and the efforts made for it to be on your plate so that I guess if it does go to waste you feel guilty (for example if ur mum took months to grow this vegetable for u to eat u would less likely throw it away and make sure u eat it fast) Also education on food how it isn't just a form of sustenance but also for your soul

Being able to share it everyone

Give the food we don't like to our pets (if safe to consume of course shout out to Missy)

Community composting, better access to "ugly" fruits and vegetables that don't make it into larger supermarkets and end up being discarded

Having testers/taste tests for certain foods so you know what you're buying maybe?

Body image

Shareness, proper app

If we lived in a city center fruit would likely still be fresh by the time it reaches us

An easier way to compost food in urban areas

Better standards in store produce from farm to shop being at the appropriate temperature

Overconsumption is a big issue especially in the Western world, so something that could restrict this type of buying behaviour

If composting was easier, too confusing

Magic meal prep robot that makes grocery lists of foods that I like... or someone to cook my food on days I don't want to cook so I don't eat out

I'm not very creative at cooking or finding a recipe I like so maybe if someone made an easy to follow cookbook personalised cookbook for me

A service to give the food to someone who can turn it to compost if viable or feed the leftover to birds.

Maybe an app which takes note of things that are left in the fridge and suggests meals based on that

more accurate serving sizes eg. pasta noodles and how much is enough for one person

Bulk buying and cooking food is cheaper but leads to more waste. So if there's a time efficient and money efficient way to make small quantities of different foods? (to have less leftovers)

Fridge Assistant AI

A fridge that not only tracks what's inside but also suggests recipes using items about to expire, maybe even rearranging shelves so soon-to-expire items are always visible.

Community Leftover Exchange App

An app that lets people in the same neighborhood share extra portions or leftover ingredients instantly—like a "food Tinder" but for giving away what you can't finish.

na

for everyone to understand the concept of zero-waste food production

Invisible fridge, AI fridge with reminder, Fridge tracking app, fridge with tablet (kind of) to show what's inside, Expiry date reminder

Fridge that doesn't let food spoil

A way to scan items I have bought or put in my fridge and be able to find a recipe using everything (within time use bys)

App showing the cheapest produce like petrolspy for food.

Better leftover food storage - not Tupperware containers

smaller portions of groceries

ai fridge that tells me when lol

A better way to store fruit, berries, oranges, bananas, passion fruit, that allows the fruit to ripen but not go bad before eating.

maybe something to help me keep track of my pantry and fridge items

For my year 12 design I created a scanner app thingy that would log your best before and use by dates on your phone and create a virtual fridge / pantry so you would know when what would expire and you could click things off as you used them.

Auto cleaning kitchen and utensils, after cooking I lose most of my appetite and I want to sit and relax as I eat so I always clean first, in doing so my food tends to not be as hot.

These two factors combined lead me to not eating as much and wasting food.

Quick defrosting

I dunno I just forget I have stuff

Something that easily reminds me when food is going to go bad.

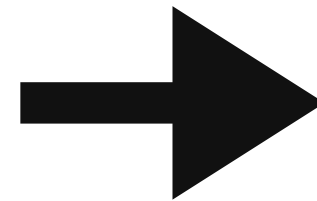
I would say a better way to organise the fridge, or maybe like some sort of tracking on fresh food.

A free personal chef pls

Something that tells you a recipe for when you have a lot of random left over ingredients that you're not sure how to use up.

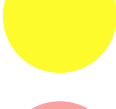
doesn't require electricity = affordable long-term maintenance + strategy

- x4  product that extends food lifespan
- x6  Easy sharing of food to those in need / or capable of using up in time
- x5  Compost/recycle food (adaptation / post food waste)
- x3  Education for food perspective (which impacts habits, behaviour & level of effort)
- x1  Better access to foods discarded / don't even make it to retail
- x2  Better food transportation (eg. speed, access, storage quality)
- x15  Effort/time saving products / reminders
- x1  Saves money
- x4  Better household food storage



out of the 52 responses

they reported wanting a product/service that offers or provides:

-  29% - Saves time/effort/involves reminders
-  12% - Easier sharing of unused food
-  10% - Easier compost/food recycling
-  8% - Extends food lifespan
-  8% - Better household food storage
-  6% - Spreading of better education around food
-  4% - Better quality food transportation
-  2% - Better access to discarded foods
-  2% Saves money

NOTE TAKING FROM SURVEY

AGE of participants - 77% - 18~24
23% - 25~34

EMPLOYMENT STATUS - majority - student, employed (46%)
 31% - full time worker

INCOME - majority (31%) - \$15k ~ \$29k *low income*
 21% - \$50k ~ \$75k
 15% - under \$15k
 14% - \$30k ~ \$49 *highly dependent on parents*

LIVING SITUATION - majority (46%) - living with parents/family
 19% - living with partner
 19% - sharehouse

NO. OF PPL IN HOUSE - majority (31%) - 3
 25% - 2
 17% - 4
 15% - 5

GROCERY RESPONSIBILITIES - 35% - specific ppl each time for everyone
 23% - take turns
 12% - everyone for themselves only
 everyone for themselves but share sometimes live alone, provide for myself.

HOW OFTEN (grocery shopping) - majority (39%) - 1x week
 25% - multiple times week
 21% - 2x week

WHO'S RESP. FOR COOKING, FOOD BUYING, STORING + DISPOSING? - majority (48%) - take turns
 31% - everyone takes care of themselves
 15% - whoever notices

MOST COMMONLY WASTED FOOD CATEGORIES

69% - cooked leftovers

65% - fresh veges

52% - fresh fruit

27% - dairy

19% - baked/bakery items

packaged food past best before

forget it's in the fridge etc.
cook too much
expecting someone else to finish
getting sick of the same meal.

perishable, short life span, must use within a few days.

INTENTIONS + PLANNING MEALS, INGREDIENTS EFFICIENTLY

majority (64%) - plan sometimes, but forget about some foods which goes bad eventually *forget!*

42% - plan + meal prep and is left with little to more leftovers to eat.

17% - bulk meal prep

8% - never plan

- freeze but freezer burn!

- plan meals but can never use up ingredients.

difficult to completely use up ingredients.

\$\$ wasted with FOOD

majority (42%) - \$25+

33% - \$10+

15% - <\$10

BARRIERS LEADING TO FOOD WASTING BEHAVIOUR

73% - leftovers not eaten

56% - spoiled before use

48% - lack of time

33% - bought too much/bulk buying

25% - habits

23% - unpleasant taste

12% - no financial constraint / some of urgency

forgot

perishables don't last long enough

busy work/assignments

aiming to "save" money but counterproductive not being able to predict how quickly / how you'll use up / eat foods

forgetting, packing more than we can eat or store (limited space?)

other options participants came up with

fear of food poisoning

buying specific / niche ingredient which is NOT very versatile

forgetting when they bought it

not knowing how long certain foods last / can't tell

TOOLS/ROUTINES OR APPLIANCES USED TO REDUCE FOOD WASTE

most likely throwing food away at once as they were forgotten about.

- 77% - freezing food — easiest — most efficient — lasts a long time!
- 71% - being mindful about purchasing habits (not more than necessary)
- 62% - meal planning / prep — useful to save money, be aware of how much you're spending — allows to instant meals after prepping — most likely frozen & lasts long time — people may get sick of repetitive meals tho
- 58% - occasionally cleaning fridge
- 33% - being creative with storing or reusing meals.
- 23% - having a food budget

REDUCING FOOD WASTE IS IMPORTANT

- 62% - Agree
- 31% - Strongly agree

whether to save money / for their own individual benefit or for planet / society-wise, majority find it personally important for them to consider, feel somewhat passionate about the issue and trying to minimise it themselves!

CONFIDENCE IN FOOD FRESHNESS / ROTTEN STAGE

- 42% - confident — this was the most expected answer however, the stats of "somewhat confident" & "not very confident" combined was -
- 39% - somewhat confident — 42.3% which makes up for almost half, in fact exactly the same as the "confident" group.
- 15% - extremely confident

BIGGEST MOTIVATOR FOR REDUCING FOOD WASTE

- 94% - saving money — instant / directly affected — short + long term individual benefit
- 64% - environmental concern — slow societal change which counts for something that people are concerned but it's more difficult to target
- 42% - improve household organisation / convenience
- 37% - health / food safety — food / meals & has a huge impact on overall health so most people would be motivated / concerned by this theme. — efficiency's food lifestyle

NOTES FROM SURVEY RESULT

- Students or workers who are more busy in their day to day life tends to forget about food they already have / let foods rot before they take action
- people sharing the fridge with others (Sharehouse especially) are not able to freely use up fridge space therefore = waste food.
- planning / prepping / using ingredients efficiently on time / storing all takes time, and effort = food waste is the easier option / accidentally lets rot.

**DRAWING CONCLUSION FROM
CONDUCTED SURVEY**

Key points I've gathered from responses

demographics
intro

SURVEY discoveries / findings
52 ppl, while the survey was completely unbiased & didn't intend on a particular demographic, due to the nature of methods of sharing (and the utilised platform), this survey received responses from the age group of 18 ~ 34, majority - employed students or working full time, who are very likely to be busy prioritising their work or university lifestyle. 46% of respondents reported low income which is categorised \$29,999 or under annually which may indicate that they would have higher motivation for trying to avoid food wastage as they have financial constraints/limitations. On the other hand, the other half of respondents who have reported \$30k+, would have less financial constraints however, may be more occupied with professional or academic commitments. Therefore less time to prioritise or be concerned about their responsibilities with ~~for~~ their food lifestyle, as well as the fact that it wouldn't personally impact them enough to care about food waste. Just over half of respondents reported to be living with other family members, and one thirds reported living alone or in a sharehouse setting, leaving them with different kinds of responsibilities and concerns around handling food.

NOTES FROM SURVEY RESULT

- Students or workers who are more busy in their day to day life tends to forget about food they already have / let foods rot before they take action
- people sharing the fridge with others (sharehouse especially) are not able to freely use up fridge space therefore = waste food
- planning / prepping / using ingredients efficiently on time / storing all takes time, and effort = food waste is the easier option / accidentally lets rot

KEY REASONS FOR FOOD WASTING BEHAVIOUR

• "forgetfulness" - 17%

then methods such as:- freezing
- being mindful with purchasing habits
- meal planning / prepping

indicating their consciousness to this prevalent problem but stats show evidence that intentions ≠ outcome.

- most people have good intentions and makes the effort to plan but is not effective enough.
- lack of communication about food and grocery shopping amongst members who live in the same household & share food.
- short food lifespan, lack of organisation and planning, improper storage, bad habits such as accidentally buying more than necessary, overestimate portions, misunderstanding date labels, ^{being} unsure of food freshness and safety, laziness, or not knowing how to store certain foods, ~~lack of time~~
- unsurprisingly, many respondents emphasised their busy lifestyles, lack of time and concern as it takes too much effort and not convenient enough for them to be motivated enough to attempt reducing food waste.

biggest motivations for reducing FW
94% - saving money
64% - environmental concerns
42% - household organisation & convenience

29% reported wanting a product or service which combat FW while offering features to save time, effort or involves reminders.

IMPORTANT STATS

- at least 75% of respondents reported approx \$10+ is wasted on a weekly basis due to food waste.
- most wasted food was reported to be fresh veg + fruits and cooked leftovers
- 92% agree or strongly agree with reducing food waste is important to them personally = they are already willing to work towards this cause if it fits in w their lifestyle.
- reported: 29% short food lifespan (biggest annoyance) 21% - laziness/disorganisation 17% - forgetfulness, 12% - lack of knowledge, 6% - lack of storage

THEREFORE

- what would the new design require?
- must
 - convenient + minimal effort to use & maintain (affordable)
 - to encourage consistency and long-term sustainability
 - effective at reducing/mitigating food waste OR adapt to after it has already happened (reduce the impact or reuse the waste for another cause)
 - offer/provide incentives that personally or individually benefit user (e.g. save money)

SHOULD COULD ability to determine safety of food (freshness tracking?)

WEEK 7 LECTURE NOTES

USER CENTRED DESIGN

- who are the users
- what are their needs?
- adapt to their needs! not the other way around
- think about ergonomics, context

↓
physical ↓
emotional ↓

- ergonomics

- think about different context / environments it might be in?

- understand the guidelines + standards

↓ object size vs human size → prototype! just to get a feel for the size in comparison to hand/body size.

• body size + function

Think about where buttons are gonna go?

- depending on context

↓
e.g. tent zipper is huge + easy to hold & drag
phone buttons are tiny.



→ gripping size, comfort
↓ materials
• bottle tops
• door knobs

→ grip threshold → not about strength but about the grip quality + suitability.

→ does it come w an instruction manual? → is it intuitive? familiar? (depends on user age? generation)
are the instructions embedded in the product? → try not to confuse users keep it straightforward (e.g. chair w levers)

consider: before, during + after
↓
change part? sit on deck? hammer-hold? case?

anthropometrics is a starting point!
↓
user choice / context,
don't say be the ergonomic body
said this is the average.

MATERIALS CONSIDERATION

⑦ Bill of materials

why is it important

↓

industry standard

- quality control
- quality assurance
- specification
- effective communication
- cost / budgeting
- legal assurance
- various other reasons

STANDARD / OFF THE SHELF parts

e.g. fasteners, bolts, castors, hard drives, USB (internal parts), circuit boards, extensions,

- the more standard parts you use, the cheaper (in bulk especially)
bc custom parts require more budget, labour + communication
- e.g. older cars have more obsolete parts = more expensive

CUSTOM PARTS

e.g. sheet metal enclosures, injection mouldings, die castings,

DRAWING SPECS

- have to do a technical drawing
 - ↳ more than
title, small details, annotations,
- certain no. of drawings of parts
- more basic designs = draw every part (depends on complexity of design)
- don't expect drawings of every bill of material.

WEEK 8 LECTURE

- aim high!

EXPERIENCE

↓
create appropriate positive experiences before, during & after.

↳ user expectations

↳ time (longitudinal)

↳ context (relevance)

- don't just assume, think & sketch, act it out! relevant scenarios

- familiarity

- novelty

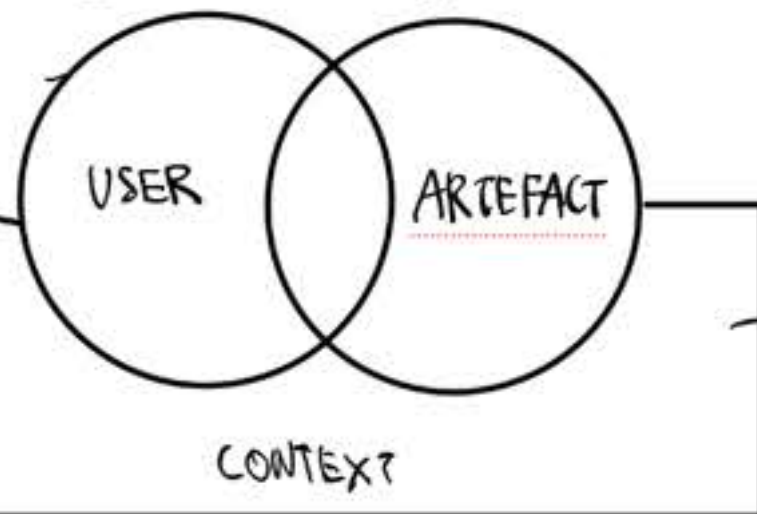
↻ balance of both!

+ surprise.

- tradition → with beliefs, materials, processes

↓
how much tradition am I going to implement with the novel but familiar design?

- sentimental → nostalgia, emotional attachment



users don't really care about the context, they need something which the product is going to provide.

Affordance - relationship between the properties of a product and the capabilities of the agent using the product.

↓
physical cognitive capabilities

SIGNIFIERS → product size, shape, grip, signs/indications of start/end of separate parts, buttons, different materials (indicating where to touch) eg. rubber = friction or non-slip.

MAPPING → association / relationship between action and an event.

↳ is it intuitive by common knowledge / familiarity

↳ no = needs affordances + indications so user can read & know what to do (signs/buttons)

FEEDBACK → interactions leads to feedback

↓
- lights up
- makes a sound etc.

CONCEPTUAL MODEL → mental model (assumptions)

↳ mental model in user's mind of how certain things can be done / capable with a product.

WHAT TO DO

- consider the experience design aspects

INITIAL IDEAS

TARGET POINTS

- younger generation (18~34 age group)

↓

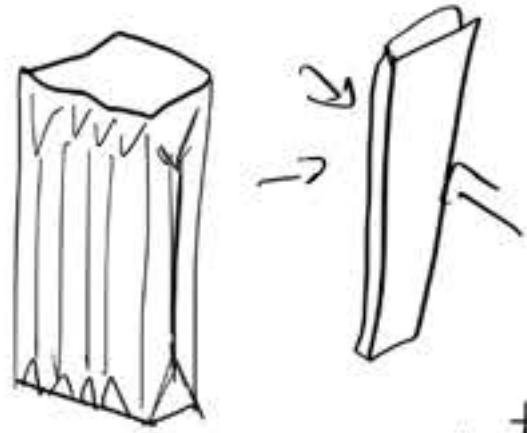
likely to be:

- pre-occupied with professional / academic commitments / responsibilities
- biggest motivation = saving money, value organisation
- does not personally prioritise reducing food waste enough.

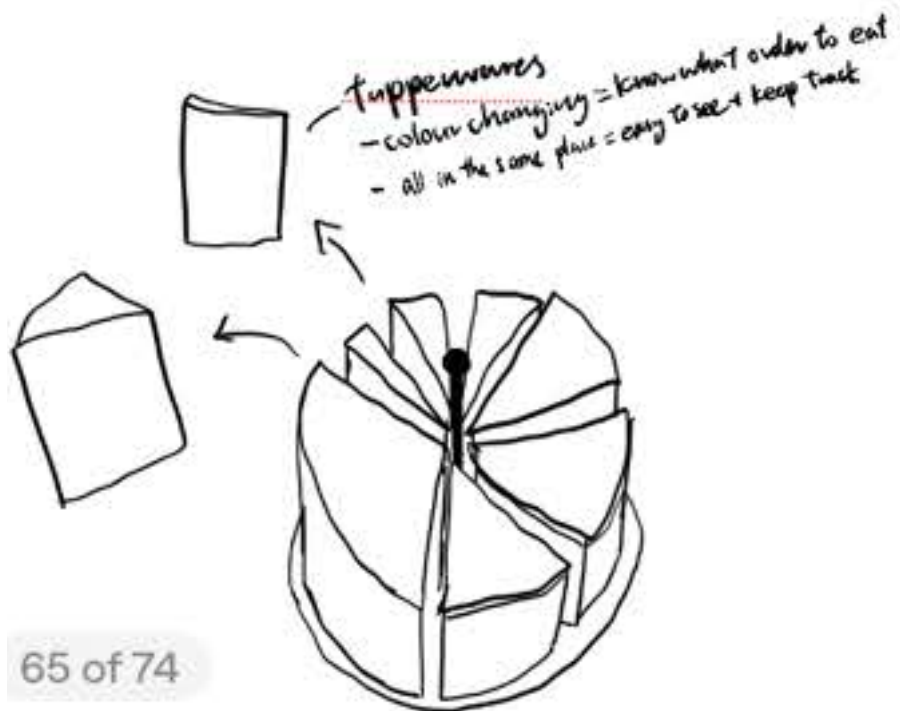
MAIN PAIN POINTS!

- not effective enough in reducing food waste
- time-consuming (to plan, organise + execute into action)
- inconvenient
- forgetting
- requires effort to use/maintain → therefore not used long-term
- does not personally benefit them / costs more
- lack of storage space
- bad habits
- lack of concern/empathy = food waste
- waste of money
- food spoils too quickly

INITIAL IDEAS



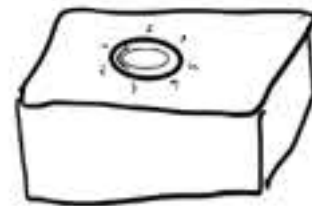
convenient
foldable takeaway
box - permanent
& portable w
no concerns of spillage.



Tupperware
with tech- integration

- reminders / sound integration
- different colour codes for different category of foods for easy identification
- various sizing / shapes
- colour changing -> indicates how long it's been since stored
material, tech,

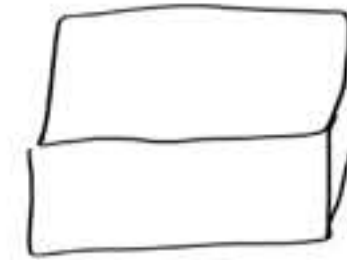
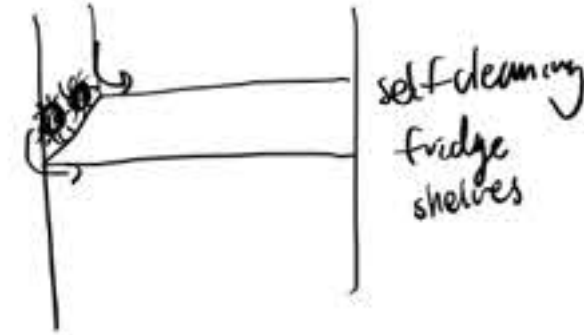
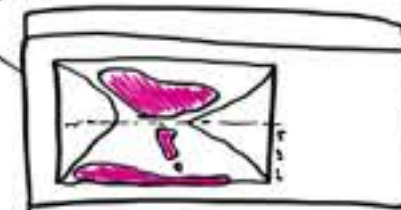
colour changing? or something
else that is also creative?



instead of colour, & using any
tech, the lid could indicate
in numbers, how many
days it's been?

analog + doesn't
require electricity or
costly maintenance

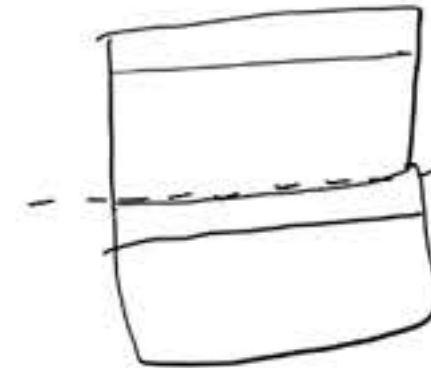
maybe flip over
when food has been
eaten to reset?



Tupperware or container
with the Stixfresh
technology integration



natural plant extract
in the plastic /
or inside the container.



stackable
tupperwares
for encouraging
organisation,
easy vision in fridge
+ save space in the
fridge by being compact

Japanese car park conveyor inspiration

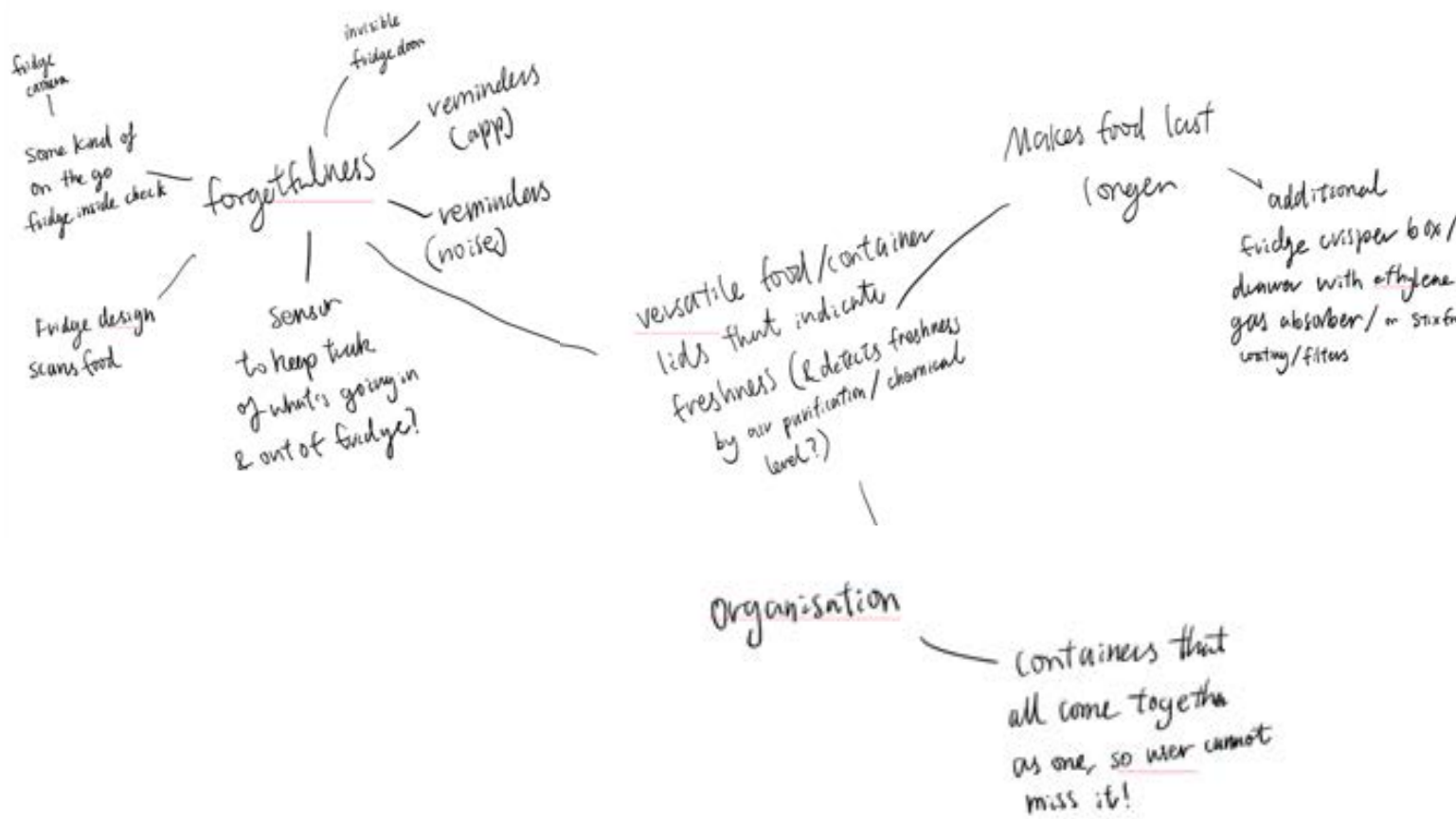
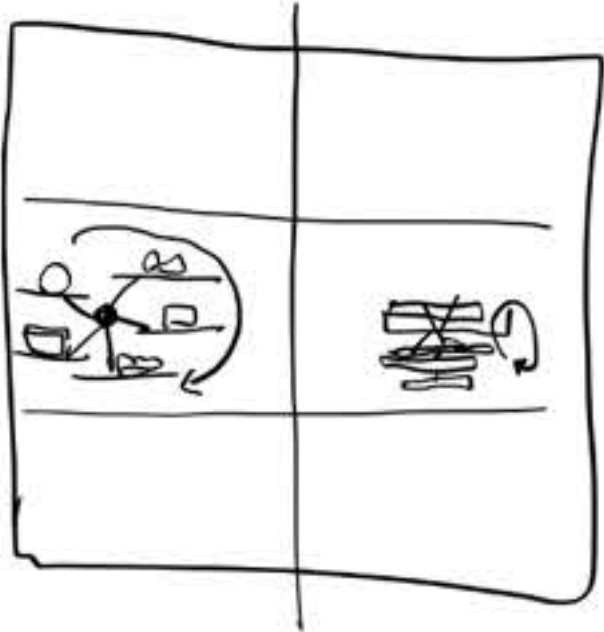


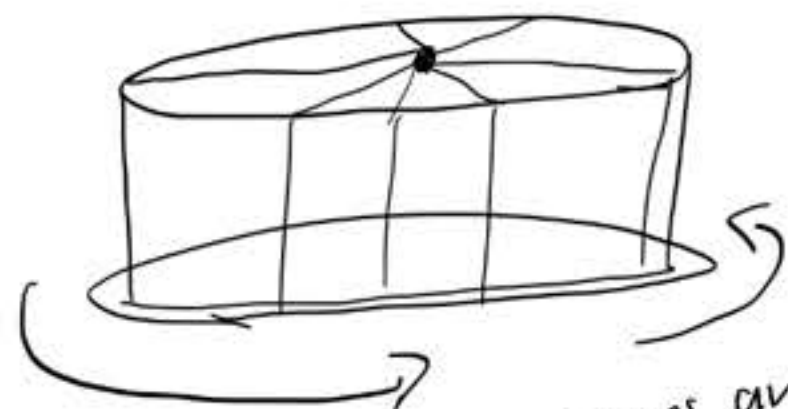
Foods becoming invisible in bulk of fridge — bright colour indicators
|
pyramidal vision
|
spinning wheel (inspired by car parks in Japan)

Lack of storage space — organised stackable design

problems / opportunities / potential tactics — Is the shape of the fridge encouraging food waste? what if it was less deep?

(inside the fridge shelf)

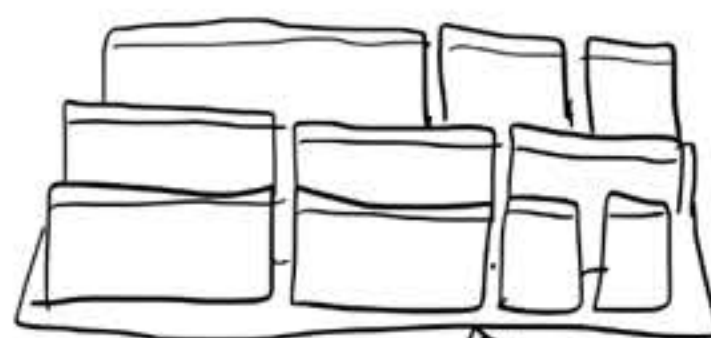




spins around?

↓
interactive

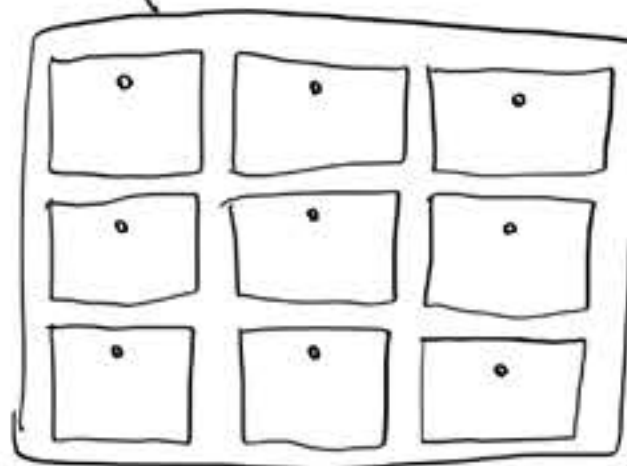
↓
encourage user
to interact / fiddle
with it everytime they
open the fridge.



easy pyramid
layer vision



cooked
lettuce
containers as
drawers



automatically
spin around
depending on
freshness to indicate
priority?

is it convenient &
in ideal condition
before, during
& after eating?

carrying,
eating out
of the container
+ when its empty
& carried back home.

containers small, compact
& easy enough to carry
as a portable lunch box?
foldable?

- what context?
- does it work for every use
- context of fridge suitability
size, shape, volume



Context image of how it would
sit inside the fridge

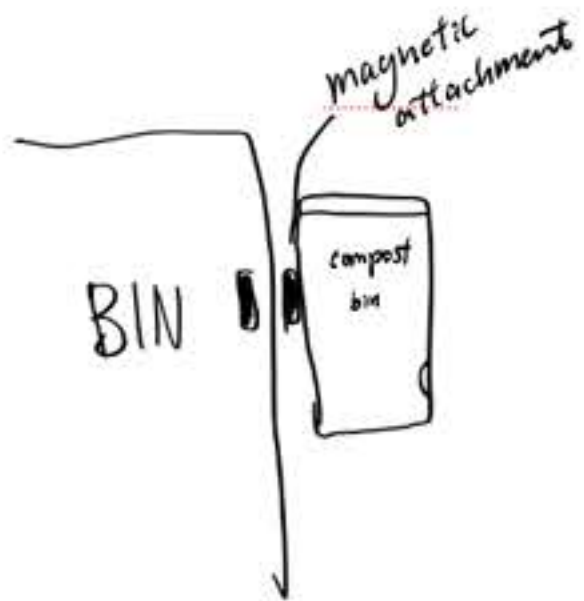


May not be as appealing for younger, busy individuals however, through my primary data collection - interview, a participant shared her experiences (ongoing routine) of planting her own plants/veges just because (experimentation, good for the planet, saves money, stays fresh much longer)



Compost bin which

- ↳ feels easier, convenient + not out of reach (magnetically attached to main bin, should be compatible with most bins) = space saving
- ↳ odour-prevention filters
- ↳ clear label + images of what can go in → less complicated, less feeling of obligation but fun rewarding instead
- ↳ money saving on fertilisers/soil for people who grow their own produce.
- ↳ shiny metal, finger-print free surface





container lids



OR
silicone food covers
which change colour

— easy, accessible
visual reminder
of priority
(what to con-
sume first)

- reusable
- versatile
- easy to wash, clean + maintain
- no battery or electricity required
- no app required

→ not sure
how to reset?

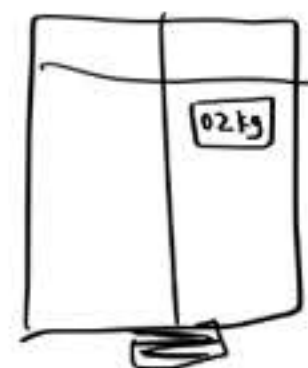
↳ Within a few minutes, the lids should be able to detect that the new foods are fresher, therefore turn green again & repeat the cycle

↓
unless I decide it has tech integration

Or water/air reactivates timer.

↓
Depends on if the colour change is based on:

- chemical ethylene exposure
- purely just the time passing (hard to reset)
- ↳ press a button & timer starts?



bin / compost bin with
a weight measurement scale integration

↓
makes users more aware of their wastage level

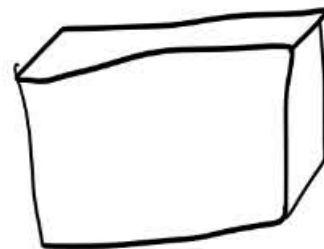
↓
more conscious = more careful with how much they're contributing to food waste as a household.

↓
always showing/displaying current number
→ goes up as soon as food waste increase and build up.



CHOSEN CONCEPTS

①



Tech-integrated tupperware

connect to an app
↓
on-the-go check
what's in the fridge
and how much time
there is left to consume it?

↓
- colour changing overtime to easily
indicate how long it has been since
purchase / cooked date

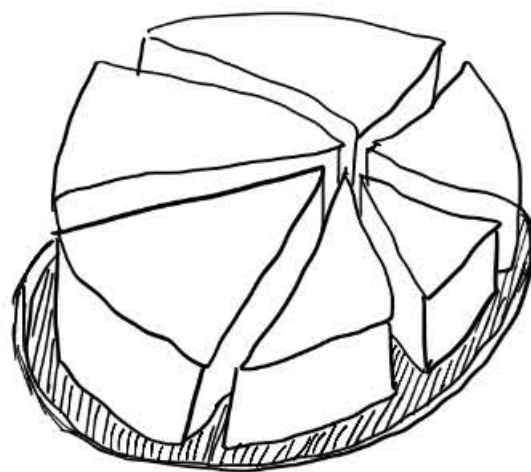
↓
consider

- how to change colour → material?
→ LED?

target pain points

- forgetfulness / reminders
- easy maintenance
- intuitive + accessible for most users
(unless they're colour blind?)

②



Spinning tupperware wheel

target pain points

- forgetting what you have
- improving organisation & visibility + keep track
- compact + gathers everything together



Compost bin

main features & characteristics;

- easier and more convenient - placed right on the main kitchen bin and easy to pop food waste into it
- compact and space saving
- odourless
- easy and not confusing - suggestions of what can go in (especially commonly used and produced compost categories)
- focus on minimalistic/clean aesthetics - nice addition for the aesthetics of kitchen
- encourage working towards a good cause = satisfaction
- direct financial incentive

Bin with scale

- makes user more conscious and aware of the level of waste they're producing - every problem and solution starts with awareness and recognising the problem as well as understanding the consequences
- encourages them to make measurable goals on reducing this as they can see the direct impacts of what the waste has on themselves
- 24/7 visuals of tracked waste weight and user can access accurate numbers of the weight across different time period accumulation



Smart fridge

- on the go access to visuals of whats going on and what's present inside the fridge to prevent purchasing duplicates of groceries (especially for people living alone who can only rely on themselves to keep track or people sharing the fridge who may deal with miscommunication or the lack of
- AI recognition system monitors the duration that foods remain untouched or unused
- data enables notifications or recipe suggestions for user to quickly use up foods about to rot (bluetooth to an app?)

Focus pain points

Ineffective in reducing
food waste

Inconvenient

No benefits or personal
incentives

More specific categories of pain points can look like this:

1. food spoiling too quickly
2. time-consuming (to plan, organise and execute their intentions into action)
3. forgetfulness
4. requires effort to maintain (therefore inhibits long-term sustainability of their tactics)
5. lack of storage space
6. bad repetitive habits
7. lack of concern or empathy (= food waste)
8. wasting money



compost bin - Anton's favourite
his feedback and advice:

- good to encourage this practice for younger people
- anton can think of businesses which i can use as a starting point - new tech, innovative that composts food . what happens after compost? think systematically. from start to ending point.
- can this device provide number of solutions
- varying context, size, where to put, environment, other options, what kind of tech does it incorporate
- heat technology, smell prevention
- what do other compost bins do. how can i be more innovative, provide more solutions.
- double check my research - look at my target audience - what do they want and need, what are their situations and circumstances

think about aesthetic

16th Sep lecture notes W9

Psychophysical properties

Aesthetic theories - KFC eg.

- colour: red connotes energy, orange = happiness, blue = stillness, stability
- shape + form: square = stability, round = softness, wedges = movement
- Materiality: metals, wood, plastic all connote different things.

could also depend on culture = heavy = good quality. Japan may consider the opposite.

(association)

colour: what do the colours represent/evolve or associate with?
 playfulness = pastels, various colour choices
 sophistication = more neutral calm colours?

Shapes = unity & variety, symmetry, repetition, complexity.

↳ find balance! find unity in variety

• balance = feel at ease

• proportion = not too big, not too small - golden ratio 1:1.61

• symmetry

↳ have to create real life prototype to see if the proportions are good! not just on the CAD screen.

Symmetry + balance = good BUT can get boring, not very engaging.

↳ not much to keep looking at

↳ can incorporate different patterns but must work in easily overall

↳ complexity + variety = sweet spot. too little = boring, too much = overwhelming.

Organisational properties

unity in variety - MAXIMUM EFFECT FOR MINIMUM MEANS

- conjunctive Ambiguity

↳ colour, interaction,

meaningful properties

↓

subjective, not properties of things but rather

- familiar things are more liked than something unfamiliar

- eg. brands creating a chain of products which all seem familiar and consistent in design, familiarity.

- Apple's consistent styles repeated shapes & details of many various products.

- originality, familiarity & consistency & immutability

↳ most advanced yet acceptable

meaningful properties

Product expression & association

- we tend to attribute many more

colour

shapes

expression/emotion - eg. face of cars - smiling, aggressive

7 principles

• BALANCE (shape & symmetry)

• CONTRAST (shape, surface material finish)

• EMPHASIS (button placement, colour, shape, what's being emphasised?)

• MOVEMENT (static)

• PATTERN & RHYTHM (complexity & unity)

• UNITY & VARIETY (different material, working as one)

•

- material, surface finish, colour, interaction, expense, usability, manufacturing - what does this imply, intuitive design, emotion, purpose)

↳ forms

↳ proportions

↳ materials

↳ surface finish

↳ colour

↳ edges/transitions

↳ aesthetic principles

• how do different materials come together? stitching? what kind of cut? connector?

• detail is very important!

↓

• can depend on context! who is the user + what do they need & feel?

• look at examples online of existing products!

**EXPLORING CONCEPTS WITH
TOP POTENTIAL**

CURRENT FAVOURITE IDEAS

- Compost bin — to encourage more people to compost by selling the idea by incorporating it with certain trends amongst younger people or implementing appealing aesthetics with incentives & convenience.
- Expanding on the Smart fridge concept

- colour changing containers OR versatile lids —
 - easier to use & integrate into everyday lifestyle
 - accessible by anyone (convenient, low maintenance + affordable (hopefully))
 - directly combats food waste by preventing food waste by preventing people to "forget" about foods they have which was one of the biggest pain points.



either containers

OR

silicone lids or container lids that come in various sizes & can be used for almost anything.

OR

colour changing cling wrap?
(so it's versatile to the MAX)

- Bin with scale — awareness is the first step to working towards solving a problem.
 - ↳ users don't realise the impacts + consequences
 - = they don't care + keep repeating food wasting behaviour

other ideas

- maybe add a "you've wasted \$___ this month." to show direct personal consequences. (biggest lesson learnt through primary research = people don't care if it's not affecting them / not their problem)
- BUT raising awareness does not directly reduce food waste. Attitude is important, but the product needs to offer a food waste reduction solution + convenience
- = maybe combine compost bin with this main bin idea? Can the entire red side of this bin automatically perform as a compost bin?

FRIDGE CONCEPT

Smart fridge

tackling the food waste problem in the most direct way,

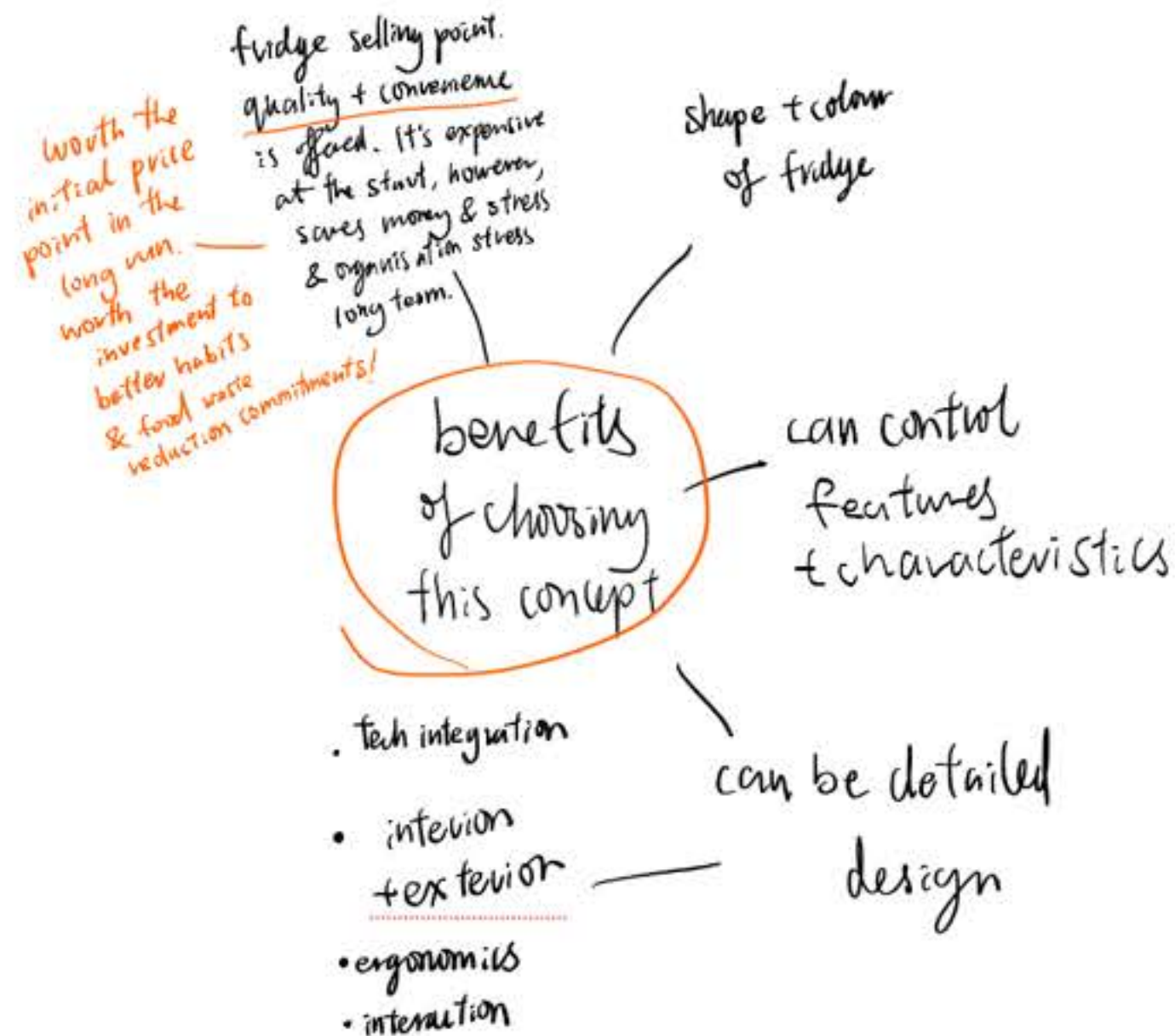
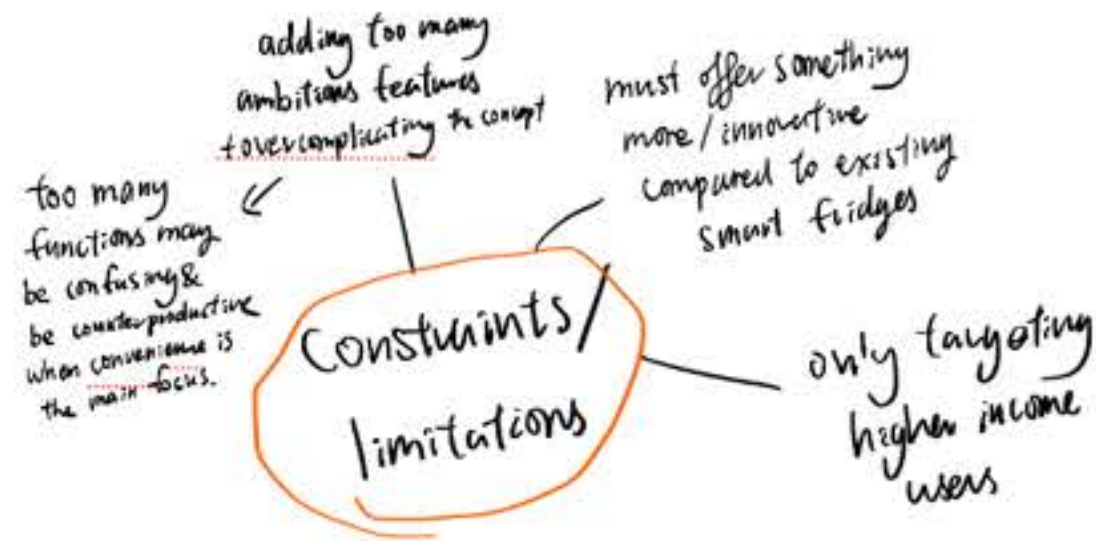


& target all 3 of these pain points

Ineffective in reducing food waste

Inconvenient

No benefit or personal incentives



target = higher income users (who have money but not necessarily the time to look after eating habits and handling food)

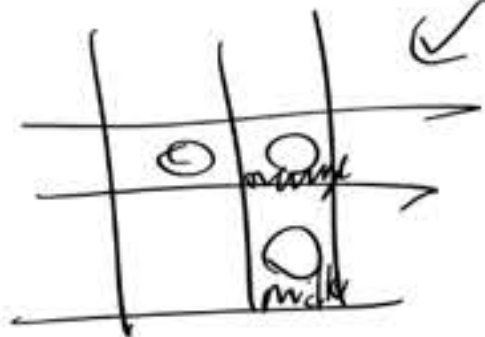


- fridge →
- makes it as convenient as possible for the user to take advantage of fridge features + put it to good use
 - easy to maintain
 - aesthetically pleasing
 - features that may involve reminders or smart features (tech integration)
 - effective in reducing food waste
 - encourages or makes efficient food turnover easier

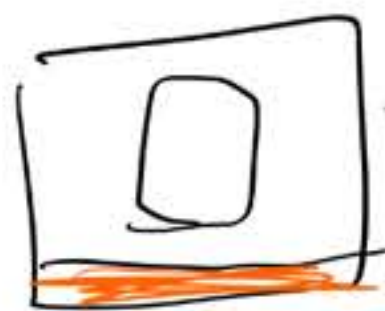
flat fridge (like ice cream fridge)



like a vending machine?



✓ easy to see what u have
and what's missing from
the "fruits shelf"



light colour
to indicate
freshness?

use keyshot!

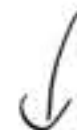
easiest option
for beginners

instead of cam - > expensive



use weight tracking

fridges that
can create a no
oxidation = no rot



inspired by fridges
in space!

vacuum
out air

POTENTIAL PRIORITE IDEAS/FEATURES

ethylene gas absorber/filters
(either to be applied and replaced occasionally
OR implemented in the fridge & self-maintained)

some kind of colour/visible measurable indication of food freshness & priority?

ethylene gas detecting fridge shelves? & change colour to communicate to user?

shelves/walls which then glow/start changing colour?

OR shelf turns on alert lights if they have been sitting there for a certain period of time?

UV-C light exposure on foods (fresh produce/meats)
can slow down spoilage by reducing microbial growth

has to be carefully timed → this light can be harmful to humans (skin & eyes)
too much of this light = compromise food quality & nutrients (can cause discoloration)

vacuum sealing

↓ prevent oxidation = extend food shelf life

↓ the whole fridge can have oxygen reduced by the main fridge door having a tight seal

↓ replace air with a mix of gases (lower oxygen/higher O_2)

existing design

↓ fridge drawers which evacuate air from the touch of a button → to store oxygen-sensitive foods inside (but everything else in the fridge is not protected by this tech)



HITACHI R-WB640VGB1X 4-DOOR FRENCH BOTTOM FRIDGE FREEZER WITH VACUUM SEALING DRAWER - MATTE GLASS WHITE

tech integration

AI support

recipe suggestions

reminders thru phone app?

24/7 inside the fridge live camera

↓ connected to app = on the go vision of inside the fridge

automatically tracks how long foods/leftovers have been in the fridge for
help determining/predicting certain food's shelf life.

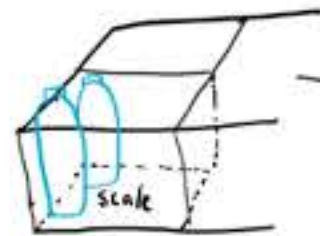
instead of a traditional horizontal fridge, a flat fridge with a clear glass door.
+ Just like commercial ones (with eg. ice cream inside) certain sections could be implemented?

FLAT SCALED FRIDGE

free space

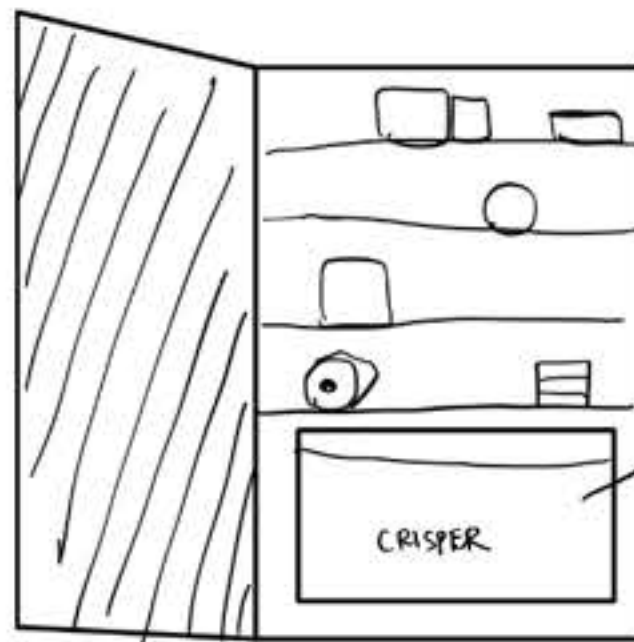
sliding door

MILK	meats	—	—	
eggs	—	—	—	

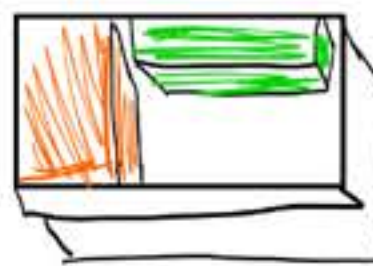


instead of a common (bc they use up more electricity + more expensive to maintain), use more traditional + analog weights + sectioning of the fridge to determine what's available & stored in the fridge.

exposure of this light to most foods
= kill bacteria
= longer life.



HUMIDITY CONTROLLED CRISPER DRAWERS



separate sections, different controlled temp. depending on the stored produce?

humidity control in each drawer

+ colour changing dummies to indicate nearing expiring dates to detect level of ethylene gas produced & released into the drawer atmosphere



controlled atmosphere in terms of
- temperature
- oxygen control
- moisture/dehydration
- ethylene gas sucking

FRIDGE WITH ANTI-SPOILAGE LIGHTING



UV-C light (200~280nm)

- damages microbial DNA, kill bacteria and some pathogens on surfaces.
- but is harmful to human skin/eyes if exposure happened long enough
- degrades food nutrition & aesthetics.

Blue light (450~470nm)

- antimicrobial properties especially against bacteria + fungi.
- slows mould growth (especially bread, strawberries + meats)
- long exposure could affect texture or cause photo-oxidation

Red light (660~730nm)

- mimics plant cycles → helping leafy greens continue photosynthesis post harvest.
- only works for plant based foods, not meat/dairy
- an option just for the crisper drawer (cause it's intended for veg storage?)

Violet light (405nm approx)

- also known as antimicrobial violet light
- produces reactive oxygen species that kill molecules in microbes
- more gentle & harmless in comparison to UV-C, safer for people
- proven to reduce spoilage organisms

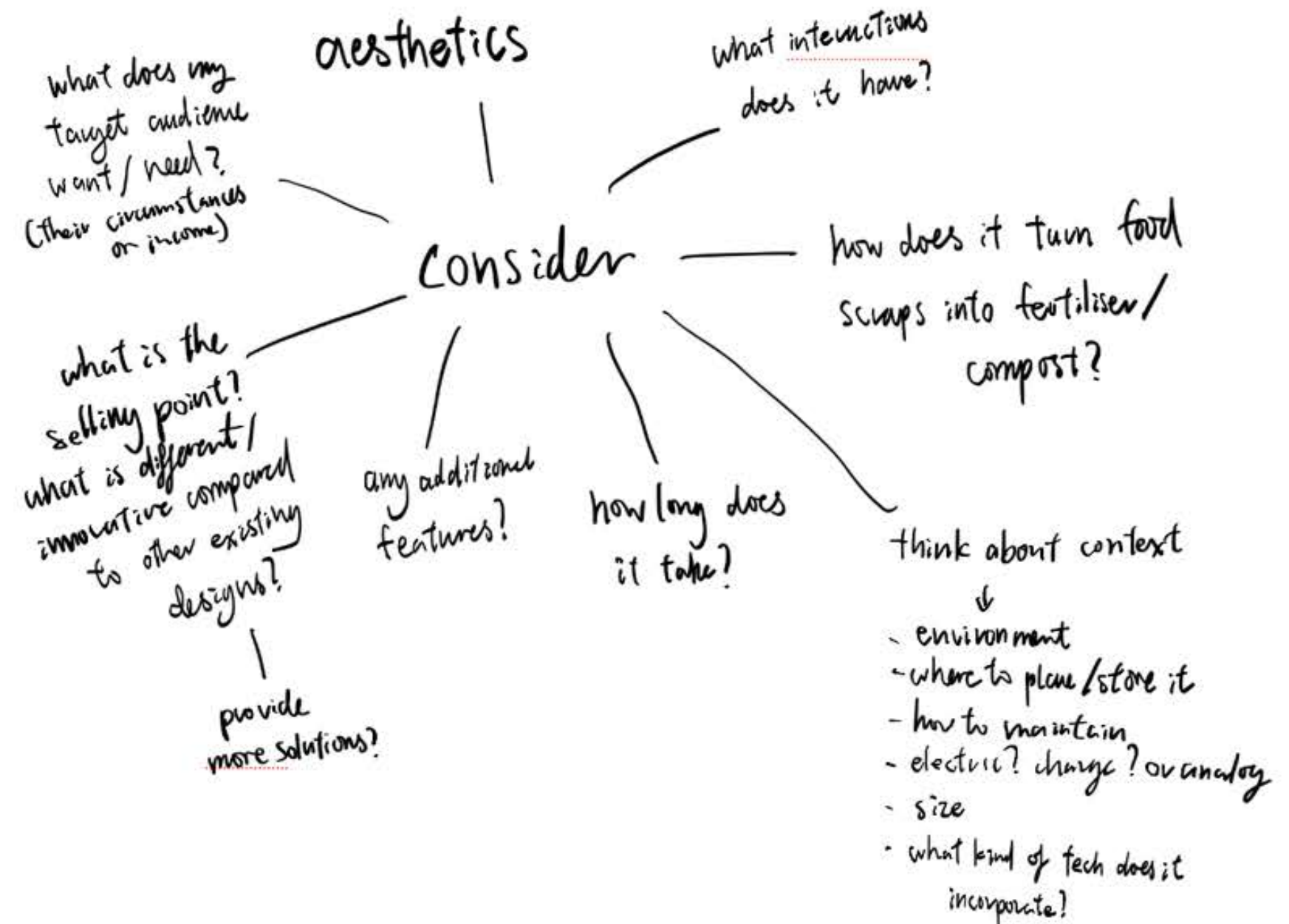
COMPOST BIN CONCEPT

CURRENT COMPOST BIN CONCEPT



- very within reach → attached/right beside the main bin!
 - ↳ compatible with any bin → attached by 2 piece magnets → accessible & convenient
 - ↳ compact & doesn't take up space
- odour neutralising filters → comfort, cleanliness
- clear label images of scrap suggestions / knowing what can + can't go in
 - ↓ Simple & Straight-forward
 - ↓ confusion = hassle some, obligation
 - ↓ encouragement, motivation + rewarding feeling
- saving money on fertiliser → as well as rewarding feeling of contributing to better the environment & direct financial incentive.
 - ↳ also less burden & guilt as "wasted food" is recycled and still useful for something else.
- clean, organised + minimalistic aesthetic (motivation/a nice visual addition to the kitchen)
 - fingerprint proof (easy maintenance)
 - nice colours (suitable for certain user/trends/preferences/context & expectations)
 - ↳ visual cues, aesthetic theories, materials + finishes

to encourage more people to compost by selling the idea by incorporating it with certain trends amongst younger people or implementing appealing aesthetics with incentives & convenience.



Alex's feedback

- go with the compost bin
- aesthetically for the kitchen
- implement concept 5 (the awareness factor - you saved ... \$ today)
to motivate user and provide users with tangible, measurable goals.
- be creative with features other existing designs don't have. → nice column, keep it simple! but perfect it.
make it very effective.
- straightforward and simple, convenient design
↓
- motivate people to actually use it long term and not forget or become lazy with it.

Existing design features and characteristics

WASTE REVIVOR

- creates soil by grinding fertiliser
- soil cooling is 5 mins
- built in UV light to kill bacteria
- dishwasher safe
- odourless - refillable carbon filter
- 6 buttons → straightforward
- includes childlock

LOMI

- can put food waste, plastic cutlery and biodegradable plastics
- few hours later → compost
- odour neutralised

THRIVE

- only takes 2.5 hours
- 2 L
- thermal protection
- able to put in any food waste
- child lock
- dishwasher safe
- silent

TERO

- all types of food can be put inside
- takes 4 ~ 8 hours
- odourless
- physical bin design allows waste to be inserted straight from the cutting board → mess free
- bucket comes out and can be put in dishwasher

KALEA

- takes 48 hours → *therefore the compost bin cannot be used until it's done??*
- Step 1 - processes & dries scraps
- Step 2 - composting chamber → wake up the microorganisms
- Step 3 - intelligent sensor system measures, controls temperature, humidity & ventilation
- reduce scrap volume by 85% (when turned into soil)
- app integration for:
 - monitor compost
 - see your environmental impact
 - learn gardening tips
- must be plugged in to a port

*pointed out that many simple compost bins are NOT REAL compost
↓
some only shred & dry scraps which can be toxic to plants*

VITAMIX

- can perform multiple cycles per day
- dishwasher safe
- as quiet as a fridge
- heats up when performing (260°F) to kill 99.9% of bacteria
- German carbon brushes (proprietary motor) → odourless

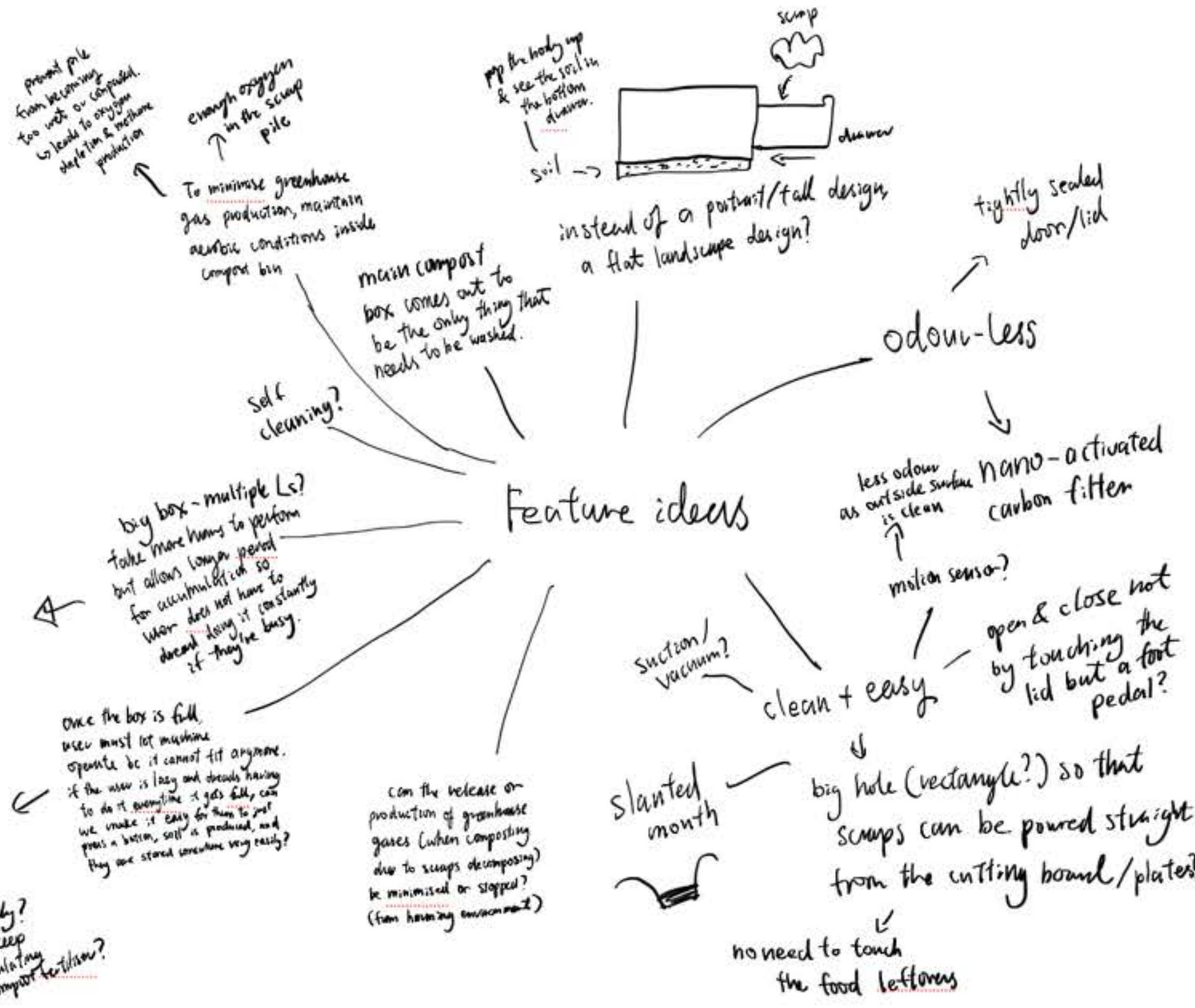
both during machine operation + when it's starting to pile up with scraps

pain points which can be considered/solved by compost bin

- rubbish stinks!
- gross to touch - undesirable labour
- hassle to maintain and clean
- takes too long
- can't fit much scraps
- unsure if the compost is good quality (bacteria)
- loud

disadvantages of composting

- compost quality depends on what scrap ingredients were used.
- can be a slow process (to do it properly)
- composting can spread diseases
- not all organics are suitable for composting
- composting can contain harmful/damaging components
- composting is not necessarily the alternative to landfills but almost the same → leaves organic materials to decompose
↳ therefore releasing greenhouse gas into environment



What is Composting?

Composting is the managed, aerobic (oxygen-required) biological decomposition of organic materials by microorganisms. Organic (carbon-based) materials include grass clippings, leaves, yard and tree trimmings, and food scraps. The end product is **compost**, a biologically stable soil amendment that can be used to build soil health and provide nutrients to plants. Microorganisms feed on the materials added to the compost pile during the composting process. They use carbon and nitrogen to grow and reproduce, water to digest materials, and oxygen to breathe.

Benefits of composting traditionally or in general

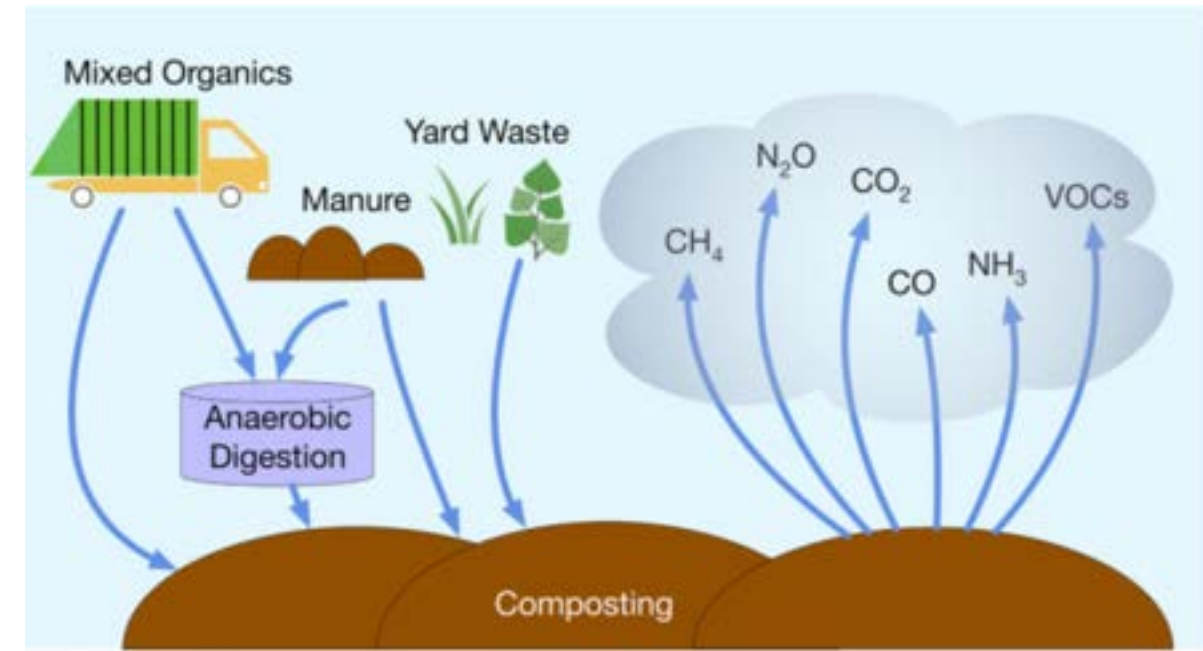
- reduce volume of trash = reducing greenhouse gas from being released into the atmosphere
- waste turned into nutritious soil amendment to better the environment
- resourceful way to recycle the food scraps and yard trim you generate at home all year and manage your waste more sustainably
- minimal effort, although is a long process which requires patience
- financial incentive by producing your own high quality soil amendment compost = reducing use of fertiliser or pesticides
- use your compost to build healthier soil, prevent soil erosion, conserve water, and improve plant growth in your garden and yard



disadvantages of composting

- Compost quality depends on what scrap ingredients were used.
- can be a slow process (to do it properly)
- Composting can spread diseases
- not all organics are suitable for composting
- composting can contain harmful/damaging components → contamination from: eg. pesticide-treated plants or diseased plants
- composting is not necessarily the alternative to landfills but almost the same → leaves organic materials to decompose
↳ therefore releasing greenhouse gas into environment
- potentially harmful and pose health risks from exposure to:
 - bioaerosols
 - pathogens
 - gases (especially for immunocompromised individuals)

HOW CAN THIS PRODUCT ENSURE SAFETY, EFFECTIVENESS, EFFICIENCY & QUALITY?



composting = source of GHG & air pollutant emissions

current tactics

- very tight-fitting lids with gaskets → prevent gases & particles from escaping.
- latch lock lids
- carbon filters → for odour and gas control absorb odorous gases eg. ammonia or sulfur compounds
(they are to be replaced every few months)
- airflow control → controlled aeration fans that direct air through a filter before exiting, = ensuring air is never vented raw into the kitchen atmosphere.
- high heat / pasteurisation → killing common pathogens (eg. salmonella / E-coli)
↳ accelerating drying = reducing microbial activity that could release bioaerosols.
- desiccation (rapid dehydration)
- curvy / fewer crannies design = easier to clean & less microbial buildup
- gas sensors

EXISTING COMPOST BIN REVIEW (PROS + CONS)

OXO Easy-Clean Compost Bin



- affordable
- odour- locking lid
- one-hand operation
- easy cleaning due to rounded walls
- small countertop footprint
- small capacity (slightly inconvenient as you have to use it multiple times regularly as accumulation happens quickly)

Vitamix FoodCycler FC-50



- speeds up food breakdown
- can put in meat and dairy
- very quiet
- only produces soil-like material and not real compost fertiliser
- slightly bulky design
- requires electricity (may be more costly to maintain long term)

Utopia Kitchen Stainless Steel Compost Bin



- odour absorbing charcoal filter
- easy to clean
- sturdy design
- versatile, timeless aesthetics
- big enough to last a week for approx 2 ppl

- finger prints show easily = requires frequent cleaning
- filter needs maintenance (needs to be washed weekly)

- elegant, minimalist simple matte finish
- stay-open lid (and large hole = no spillage or annoyance)
- handy carry handle

- needs frequent emptying
- not fully pest proof (easily attract small flies if neglected for more than a day)

Brabantia Sort & Go Food Trash Can



IN GENERAL

- Compost bins which only takes a few hours = do not produce real compost fertiliser.

MOST IMPORTANT FACTORS TO CRITIQUE OVERALL CB QUALITY

1. performance + effectiveness
2. odour control
3. capacity
4. ease of use/maintenance & storage
5. design
6. size
7. features
8. material

TYPES OF COMPOST BINS

countertop bins

- small & portable enough to sit on kitchen bench or under the sink
- easily access

Food recyclers

- electric + uses heat & grinding to reduce food waste into a dry soil-like material in a short timespan

Worm bins

- reliance on worms instead of electricity to break down scraps into nutrient-rich compost

Bokashi systems

- uses beneficial bacteria to ferment food waste → allowing a wider range of scraps to be processed.
- end product needs to be buried in soil or added to another compost system to fully finish breaking down.

HOW WOULD USERS ACCESS / APPROACH their bin? (main household bin)

A
REALISTIC
SCENARIO
(current situation)



If compost bin was
separate and not right
beside each other, on
lazy days, they might just
chuck everything in their
main bin.

- inconvenient
- it's a hassle to have to know
what and how to separate what
can + can't go in the compost bin

potential designs
to maximise **CONVENIENCE**



• potentially designs for
outdoor?



hanging on the edge of a
kitchen bench door or
attached to a wall?

POTENTIAL MATERIALS / COLOURS / FINISHES



stainless steel

dishwasher safe.

no colour, naked & basic metal colour



high quality stainless steel

minimalistic & stylish



polypropylene plastic (PFOA, PFOS, & BPA free)

plastic



Virgin plastic material
Expected to last 10+ years in the garden



mixture of
-resin
-bamboo fibre
-corn starch
-walnut fibre

comes in two colours



contrast is very nice but maintains harmony in terms of the natural theme.



plastic

polypropylene plastic & stainless steel carry handle

cannot wipe or wash polypropylene with harsh chemicals as this can damage material's fibres & colours.



chrome & bamboo



galvanised steel with powder coating (steel coated in a protective layer of zinc to prevent corrosion)

To conclude: things I noticed in general

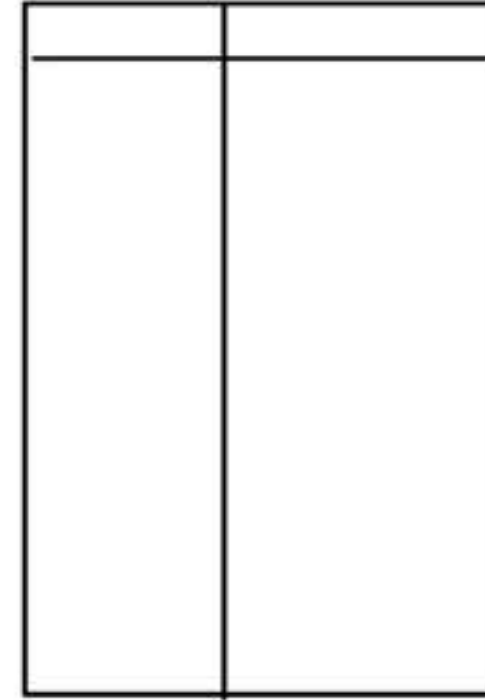
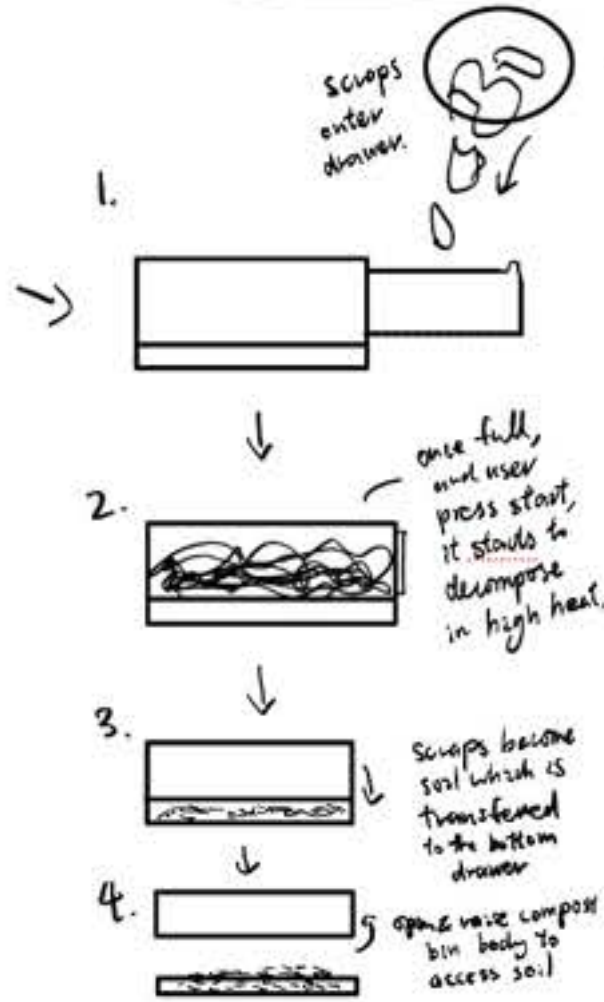
- many household CB are white. very minimalistic & trying to push the clean look as well as be suitable for any kitchen aesthetically.
- majority of designs are composed of PP plastic or stainless steel. some have more nature aesthetics with an addition of wood, bamboo etc.

INITIAL COMPOST BIN DESIGNS



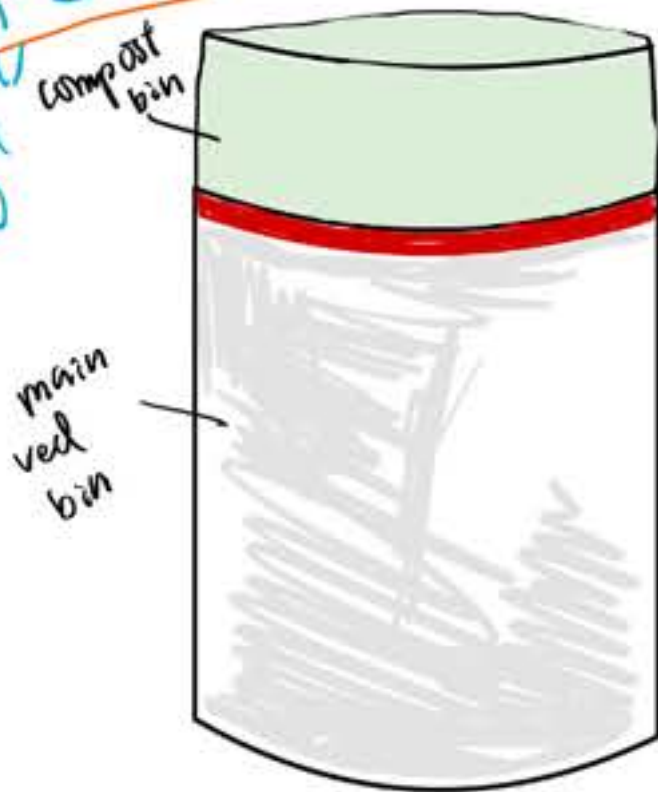
FLAT DRAWER COMPOST BIN

context
← pic

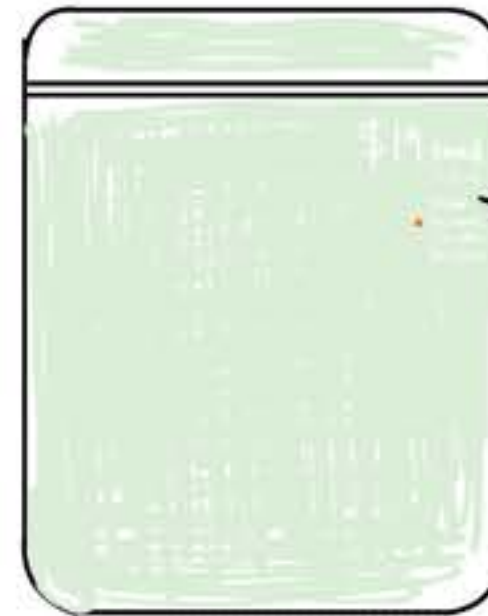
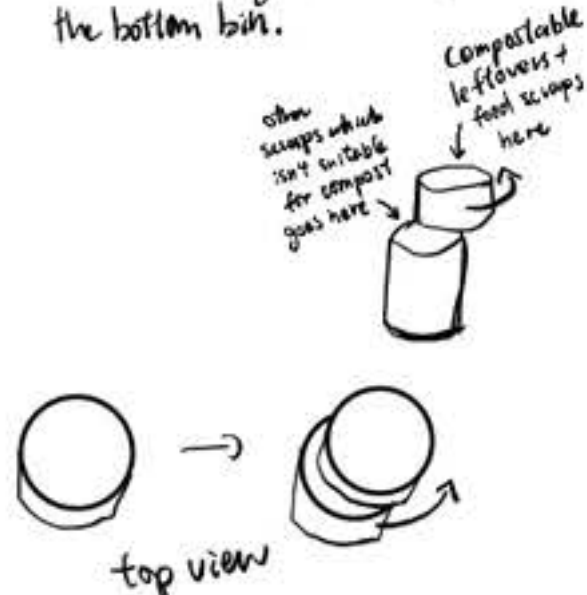


RED BIN + COMPOST 2 in 1

(with swivel turning lid access)



- first option - user sees compost bin (they cannot miss it & are encouraged to put in compost).
- any other food leftovers - slide top bin to the right, and pour in the bottom bin.



COMPOST BIN combined with my initial concept 5

- makes user aware of their
- savings
- environmental impact contribution

therefore, they would be motivated to work harder and be able to feel satisfaction from doing good for the environment.

It is effective because their impact is visually presented in a measurable way.

- + "you prevented ... of greenhouse gas from being released into the atmosphere"
- + or make it more clear what that impact looks like
- + "you saved 100 turtles from being killed! thank you!"
- + "you stopped 200 plastic bottles from going into the sea/beachfill!"

Today 20th

☐ at least 1 initial concept pg

☒ finish material & finish exploration

☒ compare purpose of compost bins (elec vs trad.)

☒ ↓
and what does this mean? what's missing? what could be done better / more innovative? can I combine all the useful & effective features into one? could I make real quality compost from an electric CB?

☐ make a benchmarking page for electric compost bins
(using criteria from a few pgs ago)

↓
☐ draw conclusion. what does this mean? which features to pick & choose, get rid of. what's effective & what's not.

↓
& possibly try and incorporate OR try and recreate how traditional methods are done by using tech?

☐ why are the existing CB designs mostly made from the same material?
can I design with more innovation? what are the requirements of a CB? (non-negotiables for good quality CB)

consider context of target user.
→ do low/high income young ppl have gardens? pot plants? would they just want to reduce the volume of food waste? donate it? do they care about creating real compost? or just the fake soil/grinded scraps are enough? How is it actually benefiting them?

- aesthetic

- performance + effectiveness in reducing volume of FW

- effectiveness in producing real, good quality compost fertilizer/soil

- ergonomic considerations

- accessibility

- affordability

- durability / ^{quality of} material

- convenience

- ease of use / maintenance

- compactness / space taken up

- features

- odour-control

- capacity

• Joseph Joseph
CB

• KALEA CB

• Vitamix CB

• Reecle home composter

HOW DO COMPOST BINS ACTUALLY WORK? (and what do they actually do?)

Electric indoor CB
vs
traditional method
(stonebank)

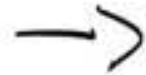
either
pre-compost
or soil amendment

CONCLUSION

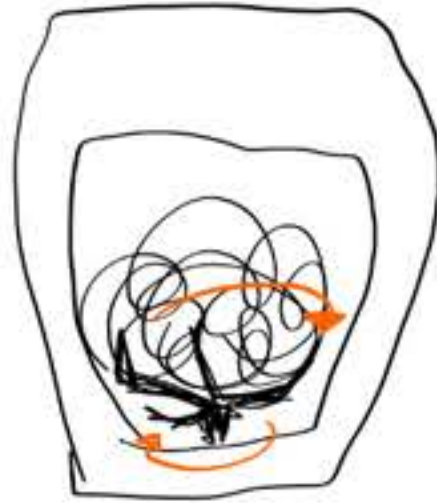
MOST ELECTRIC HOME COMPOST DOES NOT CREATE
REAL COMPOST. All they do is dry and grind scraps which
turn into a soil like material but does not have any qualities which
benefit plants in any way. BUT it does offer a quick and convenient
method to SHRINK THE VOLUME of food waste.

ELECTRIC CB

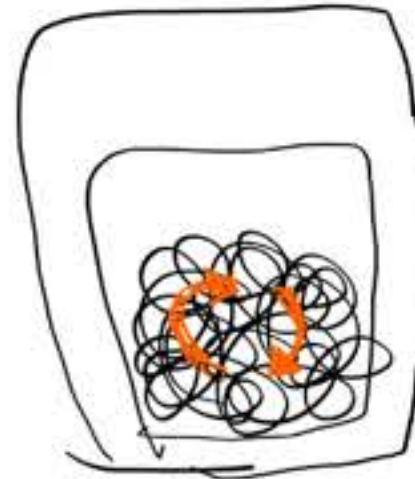
1. DRYING



2. GRINDING



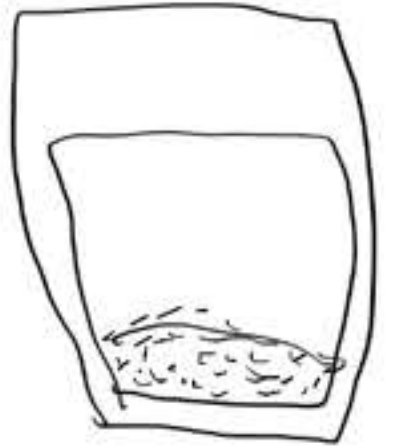
3. MIXING



4. COOLING



5. FINAL CONDITIONING



MACHINE HEATS UP (approx 160°)

- to kill pathogens & weeds
- food scraps become completely desiccated
- eliminate any moisture to dry
the scraps

benefits:

- food scraps are 90~95% which takes up volume
- preventing clogging blades, smearing instead of cutting

AFTER DRYING, THE MACHINE
GRINDS EVERYTHING

- they become fine particles (granules)
- take up much less volume than before

MACHINE MIXES ALL
SCRAP PARTICLES

- by simulating aeration
↓
speeding up breakdown (efficiency)
(replicating traditional compost methods)
↓
minimises odour
- even drying
- prevents compaction or clumping
- release harmful gases & prevent buildup
or pressure bursts

MATERIAL IS
COOLED DOWN

- cooled down before it's taken
out for:
 - safety (prevent burning)
 - cooling removes moisture from
the steam left from the heat
therefore allowing a soil like texture
+ less odour or gas
 - prevent condensation inside the machine,
= no mould, bacterial regrowth or bad odour
 - long term machine maintenance

depending on the machine but
to complete the full process, the
machine:

- keep fans on trapping toxic gas in the
filter before opening the lid (VOCs, ammonia,
biocerosols) (filter-activated carbon filter)
- resting/stabilisation mode
 - ↳ occasionally mixing/ventilating
 - ↳ preventing odour release
- high end models → UV-C light/excess burst to
sterilise surface or neutralising smells
- automatically transfer compost into a box/drawer for use
to use directly
- additional app integration
- user alert (sound, light, some kind of indication that it's done)

TRADITIONAL COMPOSTING (OUTDOOR IN THE BACKYARD SETTING)

- Ingredients needed
- carbon-rich materials (browns)
 - nitrogen-rich materials (greens)
 - water (moisture)
 - Air (oxygen)

Nitrogen-Rich Materials (“Greens”)	Carbon-Rich Materials (“Browns”)
Fruit and vegetable scraps	Dry leaves
Grass clippings	Plant stalks and twigs
Coffee grounds and paper filters	Shredded paper (non-glossy, uncolored) and shredded brown bags
Paper tea bags (no staples)	Shredded cardboard (no wax coating, tape, or glue)
Eggshells (crushed)	Untreated wood chips

Things to avoid - meat, fish and bones, dairy products, fats and oils, a large volume of cooked foods, compostable bags, diseased plants and so on cannot be put in either due to raising the likelihood of attracting animals or because some of these materials cannot break down or decompose because they need higher temperatures.



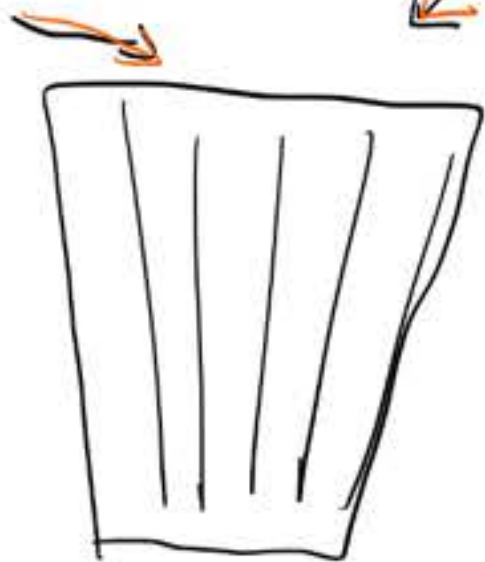
“The goal here is to lay out a diverse buffet for microorganisms to eat as quickly as possible,” Abbott-Lum says.

“What happens during the composting process is that the complex community of microbes that are within that organic material, which we call feedstocks, start to break it down in a feeding frenzy,” Silver explains.

TRADITIONAL COMPOSTING METHOD

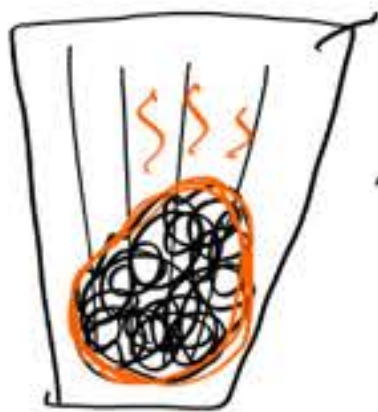
1. Gathering ingredients

- Carbon (browns → eg. dry leaves, cardboard)
 - ↳ energy source for microbes
- Nitrogen (greens → food scraps, grass clippings, manure)
 - ↳ protein building blocks for microbial growth
- Water (moisture level 50~60%)
 - ↳ keeps microbes active
- Oxygen
 - ↳ prevents odour & methane
 - ↳ essential for aerobic respiration



2. Week 1 (BEGINNING)

Fresh materials are mixed + pile heats as microbes multiply rapidly.



- aerobic bacteria break down simple sugars + amino acids
 - ↳ releases CO_2 + water + heat
- temp rise to $40^\circ\text{C}+$

3. Week 1~8 (ACTIVE + HOT STAGE)

- temp keeps rising $55 \sim 65^\circ\text{C}$ (steam may be visible)
- thermophilic bacteria digests fats, proteins & cellulose
 - ↳ converting nitrogen into ammonium
- Actinomyces and fungi bacteria begin breaking down cellulose and lignin.
- Oxygen is consumed rapidly → turning is needed.
 - ↳ high temps kill most plant diseases + parasites
 - ↳ complex, tough materials start breaking down → shrinking pile
 - ↳ nutrients compounds become more available for plants later.

CONCLUSION

- traditional composting mimics natural decomposition but in a controlled and concentrated space. Time consuming and not very convenient but this process creates nutrient rich soil - compost.

4. 1~4 months (COOLING STAGE)

easily degradable material runs out = temp falls back down to $30 \sim 40^\circ$

- mesophilic organisms (worms, beetles + springtails) return.
- Nitrifying bacteria convert ammonium → nitrites → nitrates, locking nitrogen into stable forms usable by plants.
 - ↳ soil life diversity increases
 - ↳ compost texture becomes crumbly + soil like.
 - ↳ stable plant nutrients are formed.

5. 2~6 months (CURING + MATURATION)

compost starts to appear brown/black, development of an earthy smell.

- humification → organic molecules recombined into humus (stable carbon compounds)
 - remaining lignin slowly decomposes
 - ↳ humus binds soil particles → improves structure, aeration & water retention
- Finished compost is safe for plants + soil microbiota

OVERALL - key differences between traditional vs electric

Traditional outdoor composting methods

Benefits

- Produces very high quality and nutritious soil compost which would have many benefits for the plants
- Elevates microbial biodiversity and water retention
- Does not require any electricity or technology therefore sustainable and cost-effective (with no additional or maintenance costs)
- Handles much larger capacity at once

Constraints

- Time and effort-consuming to prepare the initial set-up and gathering of the ingredients. (not to mention having to plan and organise the ingredient ratios)
- Lots of research and understanding is required
- Requires patience as it takes up to months to complete the process
- May produce and release odour which could fill the outdoor area, and potentially inside the house or the neighbours?
- Needs checkups and must be turned to aerate once in a while
- Requires an outdoor area outside the house
- Can attract pests

Indoor electric compost bin for the kitchen

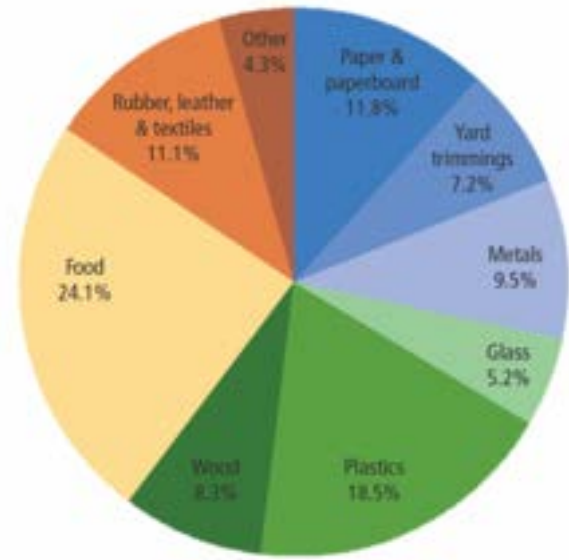
Benefits

- Convenient and time-efficient - minimal effort (touch of a button)
- Space-efficient
- Easy access as it is stored or placed on your kitchen bench
- Shrinks food waste/scraps volume up to 90%
- Saves food waste from having to be transported into landfill and reduces overall greenhouse gas being released into the air
- The process only requires multiple hours, usually up to about 8 hours before it is ready
- Effective odour and pest control

Constraints

- Most electric compost machines do not produce real compost - only dried and grinded soil-like material which has no nutritional benefits for the soil or plants and is not ready to perform as compost
- Can be expensive to purchase
- Long-term costs with electricity and maintenance
- Limited capacity at a time
- Requires filter replacement and cleaning

TRADITIONAL COMPOSTING



In 2019, **66.2 million tons of wasted food were generated** in the food retail, food service and residential sectors in the United States. **Only 5%** of that wasted food was **composted**. In the U.S., food is the single most common material sent to landfills, comprising 24.1 percent of municipal solid waste.

On top of this, **food scraps contribute to over 3% of Australia's greenhouse emissions** annually. And composting these scraps would **reduce the need for water by 30%**.

Many Council groups are taking initiative to support and facilitate community composting incentives, which has helped to **decrease compostable waste going to landfill** in Australia by around **5%** over the past two years.

IN CONCLUSION

Currently, only 5% of food waste is composted, largely because traditional composting is seen as inconvenient and time-intensive. Evidence shows that incentives significantly reduce the amount of compostable waste sent to landfill. While no perfect solution exists, even partial improvements and increased environmental awareness are far better than inaction. Taking steps—however small—creates visible reminders of food waste, shaping attitudes and behaviours over time and encouraging greater action across future generations.

THIS INDICATES WHAT?

Designed for Users Who:

- Are not gardeners or lack gardening knowledge.
- Are environmentally conscious and want to make a positive impact.
- Live in apartments or lack outdoor space for traditional composting.
- Prefer convenience and are willing to invest financially rather than commit time and effort to ongoing maintenance.

Key Insights from Research:

- Users are unlikely to engage in composting if it feels inconvenient, time-consuming, or irrelevant to their lifestyle.
- Many people are indifferent if the output cannot be directly used as compost, especially if it doesn't affect them personally.
- Younger users may feel stigma or embarrassment around traditional composting.

Electric composters aren't just for shrinking waste — they're about **removing barriers to action** (smell, space, time, effort) so more people actually do something about food waste instead of tossing everything in the trash. (which is better than thinking composting is too difficult and nobody taking any action at all)

MY CHOSEN TARGET AUDIENCE

And their wants, requirements and preferences by 18-34 yo. with mid range income and has demanding commitments therefore busy lifestyle

Wants:

- Sleek, minimalistic design that would suit the modern style of current kitchens as well as be versatile in many settings or contexts
- Quiet and undistruptive to their lifestyle or schedules especially if they are home a lot
- Rapid results
- Minimal effort and interactions involved in the process
- Potentially tech integration to maximise convenience
- Easily or clearly visible impact that they are making to keep them motivated to use the compost machine
- Maybe something that feels sustainable but also cool and forward-thinking (status/identity appeal)?

Needs:

- Mess or hassle free (user would not want to touch the raw scraps and would be discouraged to use the machine long term)
- Safe and hygienic handling — no touching decomposed or wet waste (similar point as above)
- Easy emptying process with no leaks or sticky residue
- Some kind of Odour control (filters or sealants) to keep them encouraged to use the machine without having to compromise their cleanliness
- Energy-efficient operation (low electricity use = affordable for renters/students)
- Small footprint
- Durable and reliable with low maintenance (filter changes or cleaning only occasionally)

Expectations:

- Convenience over perfection: They don't care if it's "real compost" as long as it's clean, quick, and easy
- Affordable price point (mid-range: not luxury appliance level)
- Transparency: Clear explanation of what the output is and how to use it (soil booster, safe to bin, etc.)
- Compact but sufficient capacity (enough for a couple or shared flatmates)
- Can be used on a regular basis without any complications or requiring rest periods
- Minimal noise, heat, or smell during operation
- Simple, intuitive interface — one button or app-based, no confusing controls
- Proof that it genuinely reduces waste, not just greenwashing

Compost bin placement ideas (in various kitchen designs)



hangs on pole/handle of oven/dishwasher

stuck on kitchen bench wall/edge (space saving and easy to directly pour food in from chopping board)

stuck on horizontal wall (versatile and space saving)



anywhere on the kitchen bench like other electric compost designs

polytec



attached to wall directly above sink

hung on a wall

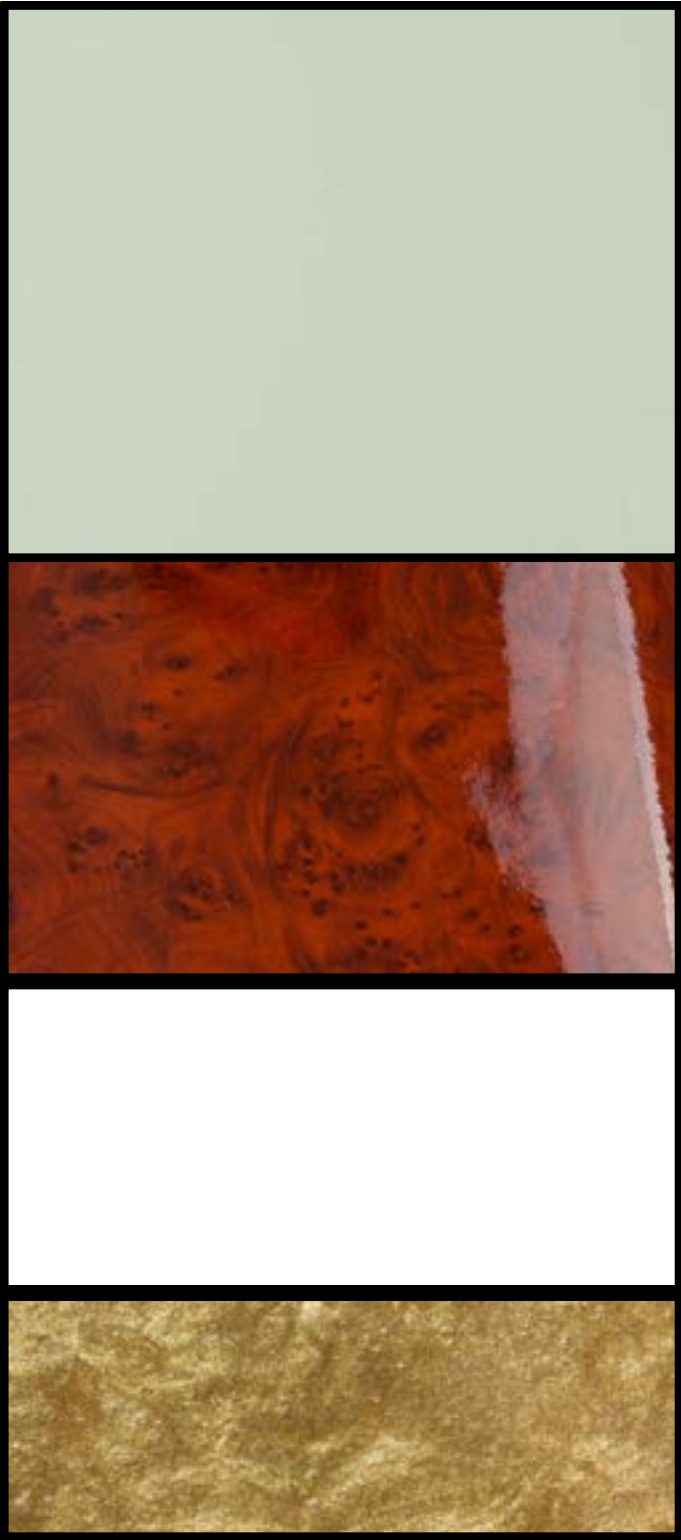


basic on the ground bin design

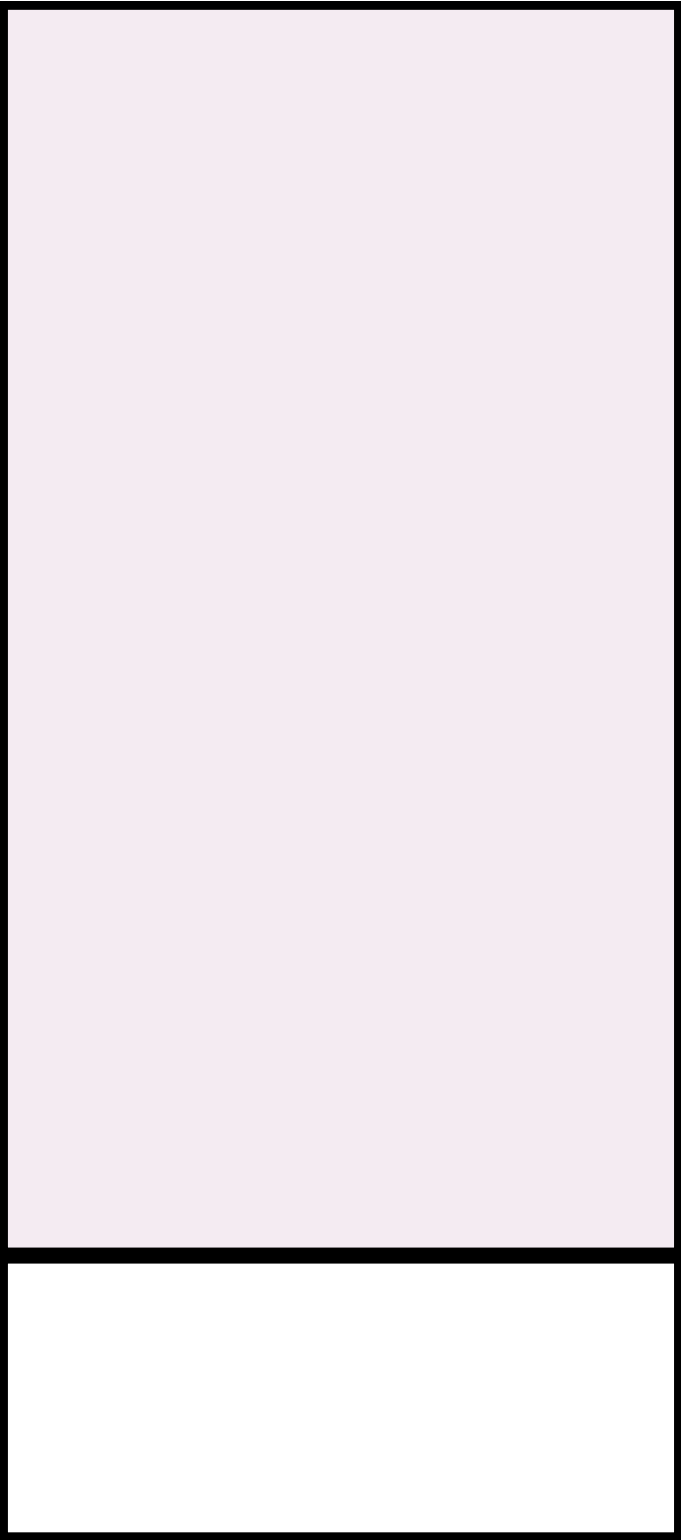
under cupboard (drawer system?)

Material & colour combination ideas

1 . luxury green and wood



2 . hint of calm but playful
purple



calm, darker blue and
wood contrast + white



The point of using an electric compost bin is to accelerate the composting process and reduce the amount of organic waste sent to landfills. Electric composters use electricity to maintain an optimal temperature and moisture level for decomposition, which speeds up the process. However, they do not produce true compost as they do not involve the natural microbial activity that is essential for composting. Instead, they may produce a material that is beneficial for soil and plants but not as nutrient-rich as natural compost. This is why it's important to consider the quality of the compost produced and how it can be used in gardening.

⇒ Compost Magazine +5

Limited Microbial Activity: Electric composters do not use natural microorganisms to break down organic waste, which is essential for composting. Instead, they rely on heat, air, moisture, and bacteria to decompose the material.

Cheaper

Machines that run on solar power are cheaper in the long run

In the long run, machines that run on solar power are cheaper compared to traditional electricity. The initial cost of installing solar panels can be high, but there are various incentives and rebates available that can help offset these expenses. Once installed, solar energy systems typically have lower operating costs compared to traditional sources, which can result in a more competitive Levelized Cost of Energy (LCOE) in the long run. ⇒ Solar Emporium



Potentially implement a solar panel on the electric compost bin

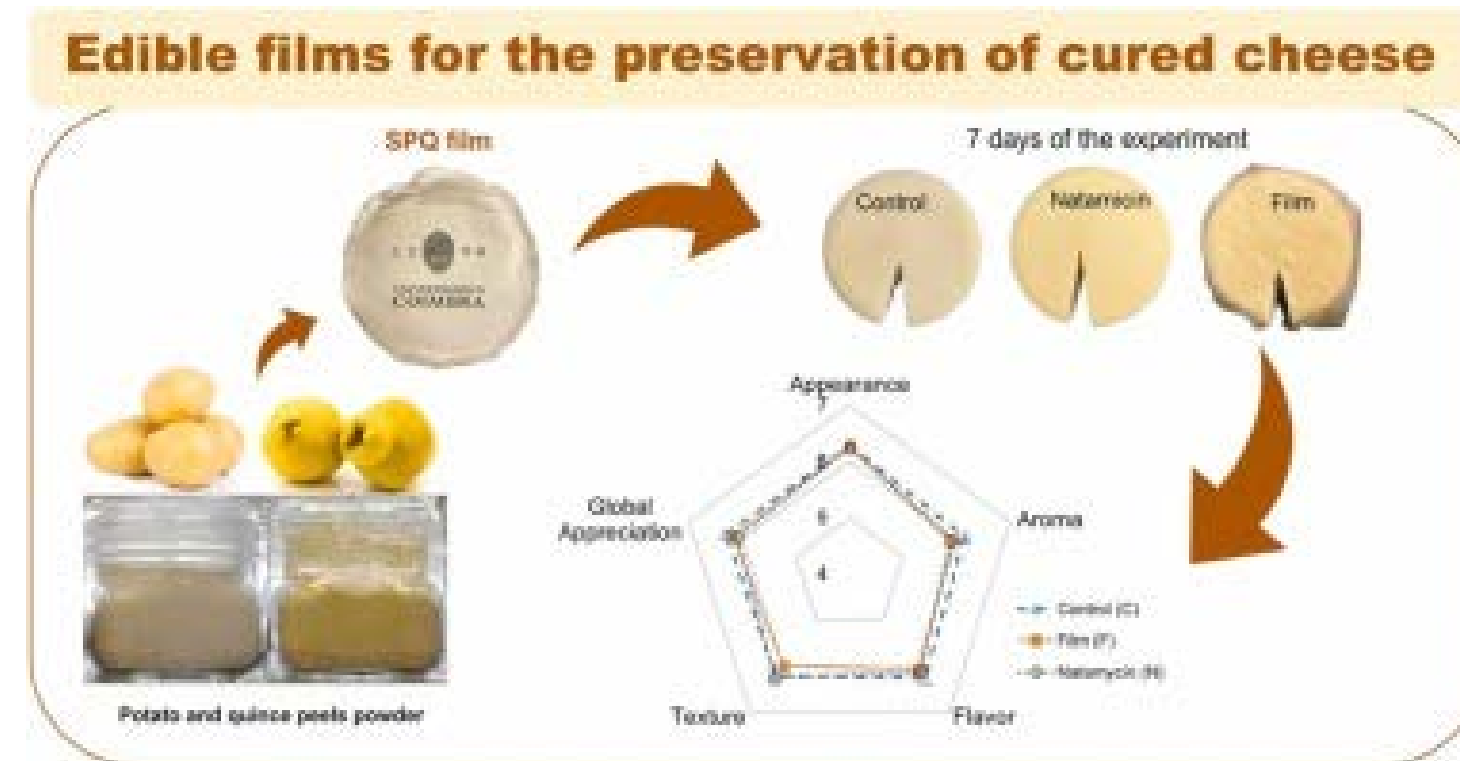
- considering that even though the entire purpose of the compost bin is to reduce the harm done to the environment by reducing the volume of food waste HOWEVER if this process constantly requires electricity and is a financial constraint, it may not be so good for the environment/sustainability after all
- - therefore implement solar panel, upfront cost may be higher however, if the user can afford that, and they intend on using it long term, their maintenance/use cost would be much less long term as the energy is supplied by the sun.

Other cases that prove using food waste for cling wrap is possible

Edible films based on potato and quince peels with potential for the preservation of cured cheese

Highlights

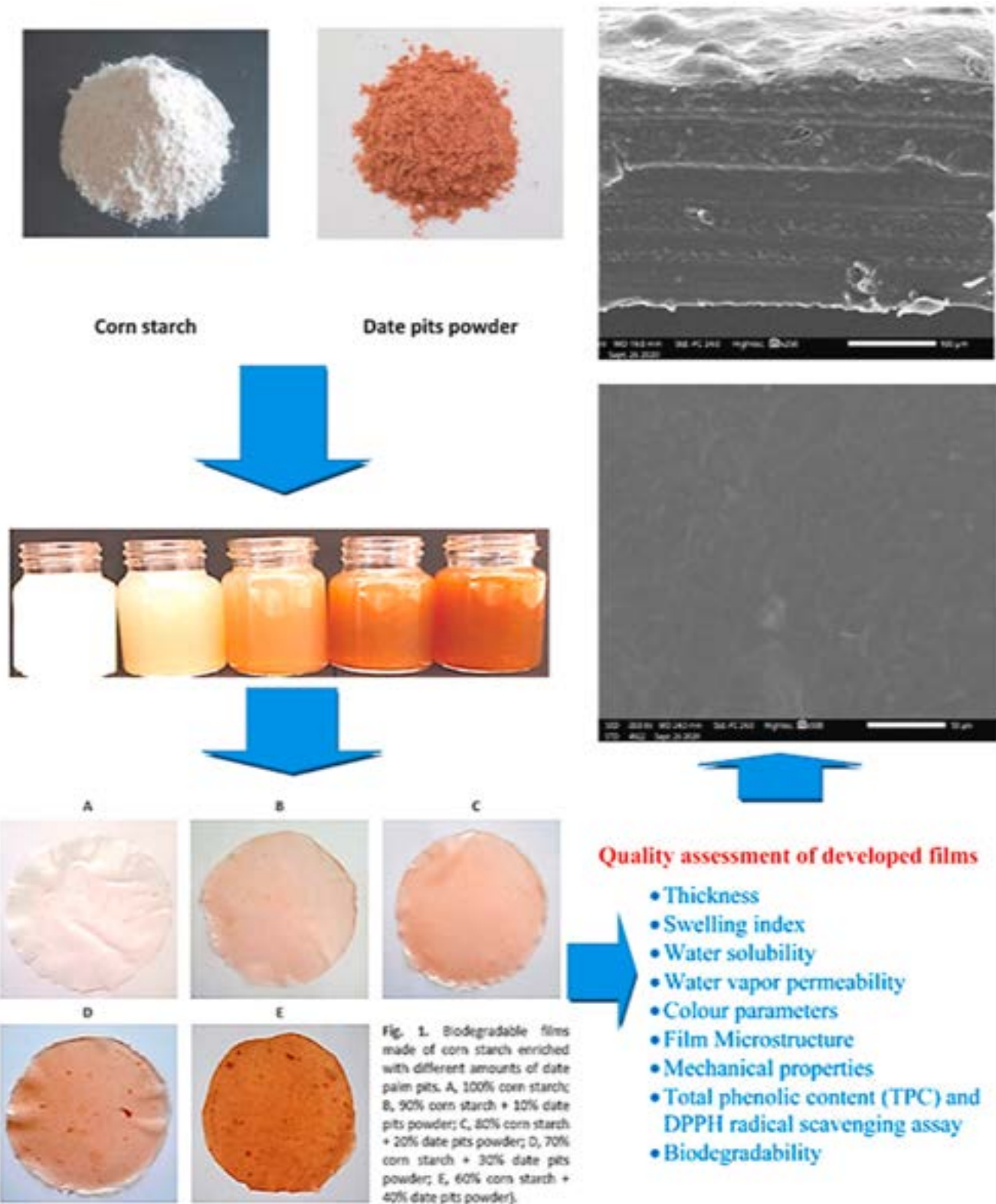
- Edible and biodegradable films were developed based on agro-industrial residues.
- Starch (S), Potato (P) and quince (Q) peels were used to compose edible films.
- SPQ formulation film was chosen for the proof of concept with cured cheeses.
- SPQ films did not change the sensory properties of the cheese.



Edible and biodegradable films for food packaging were developed based on **starch** (S) and agro-industrial residues, such as **potato peels** (P) and/or quince (Q) peels. All films exhibited hydrophilic nature, as revealed by the swelling behavior, water contact angles, water vapor sorption capacity and water vapor permeability results. Films with quince peel were the most flexible, possibly due to the presence of sugars and pectin, that act as plasticizers. The SPQ formulation film was chosen for the proof of concept with cured cheeses, and during ripening, the edible film of the cheeses was evaluated, as well as the sensory characteristics and acceptability of the cheeses by consumers. The developed film increased cheese hardness, when compared to the control and to cheeses coated with natamycin. Moreover, the **film did not change the sensory properties** of the cheeses, being a **promising film for application** in this type of food product.

Development of low-cost biodegradable films from **corn starch** and date palm pits (Phoenix dactylifera)

This study was conducted to produce a new **biodegradable film from easily available and low-cost raw materials** by casting method. Corn starch and date pits powder (DPP) in the proportions of 100:0, 90:10, 80:20, 70:30, and 60:40% (w/w) were used. Physical, mechanical, barrier, morphological and antioxidant properties of the developed films were evaluated. The incorporation of DPP increased the thickness, tensile strength, Young's modulus, phenolic compounds, and antioxidant activity of the films, but decreased their swelling index, water solubility, water vapor permeability and elongation capacity. An increase in DPP content decreased the L* values and increased the a*, b*, and ΔE values of the films. SEM images showed that the addition of DPP up to 30% improved the morphological properties of the films. **All the developed films were totally biodegradable.** This study revealed the potential use of DPP with corn starch for composite biodegradable films formulation.



cheap & fast electric compost bins

REDUCE VOLUME

of food waste by 90% (upto)

- reduces greenhouse gas emissions/methane gas from scraps rotting in landfill → global warming
- less transportation of food scraps needed as they are processed on the spot.

BUT does not create real compost.

= the "fake compost soil" cannot be used as nutritious fertiliser for your garden.

(Or is an easy alternative to produce compost like material that has some nutrients but much less compared to compost)

Because real compost requires

- microbial activity (natural microorganisms to break down organic waste).

what do users even do with their processed dehydrated food scraps? what's the point?

reduce volume of their household food waste

they care about the environment & global warming

To produce a material that has some benefits to soil & plants (but not as nutrient rich as real compost)

To produce material to turn into compost after the ECB process to speed up the overall initial composting process.

(electric!)
Food compost bins & food dehydrators are NOT THE SAME!!!

Food dehydrators → just dehydrate food rapidly & then grind into soil like material.
don't use microorganisms in the process (so much less nutrients in the dehydrated soil)

Real compost bins (electric) → use heat, air, moisture + bacteria to break down the material producing REAL compost!

PRICE POINT & CONVENIENCE

Food dehydrators vs Real electric compost bins

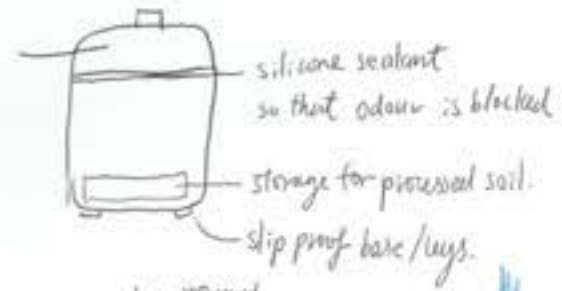
- slightly cheaper than compost bin machines (depends on model + features)
- uses electricity but for short time periods
- more expensive (\$\$\$ hundreds of \$)
- uses lots of electricity
- won't produce a large amount.

may be a dealbreaker for young adults looking for convenience if it has to be done frequently to efficiently get rid of food waste
↓
inconvenient + time-consuming
costly long term

defeats the entire purpose.

- cheaper (same price as machines)
- way less hassle, quick fix.
- no direct reduction of food waste in the household though :/

lid



or a solar powered swappable battery pack.

- other notable topics:
- integration of solar panel
 - what is actually required to create real compost & how do electric CB perform this?
 - how to minimise carbon footprint of producing, using & lifecycle of CB? plastics, metal & electrical components + manufacturing process.

should I aim to design a compost machine that can produce REAL compost that can be used as fertiliser straight away?
OR be creative with the convenient fast food dehydrator compost bin & add other functions, features
↓
produce something with dehydrated food.
more complex design, process + interaction & more parts to consider.
intend on producing soil that just speeds up the overall compost process for ppl who need real compost.

OTHER THINGS TO CONSIDER

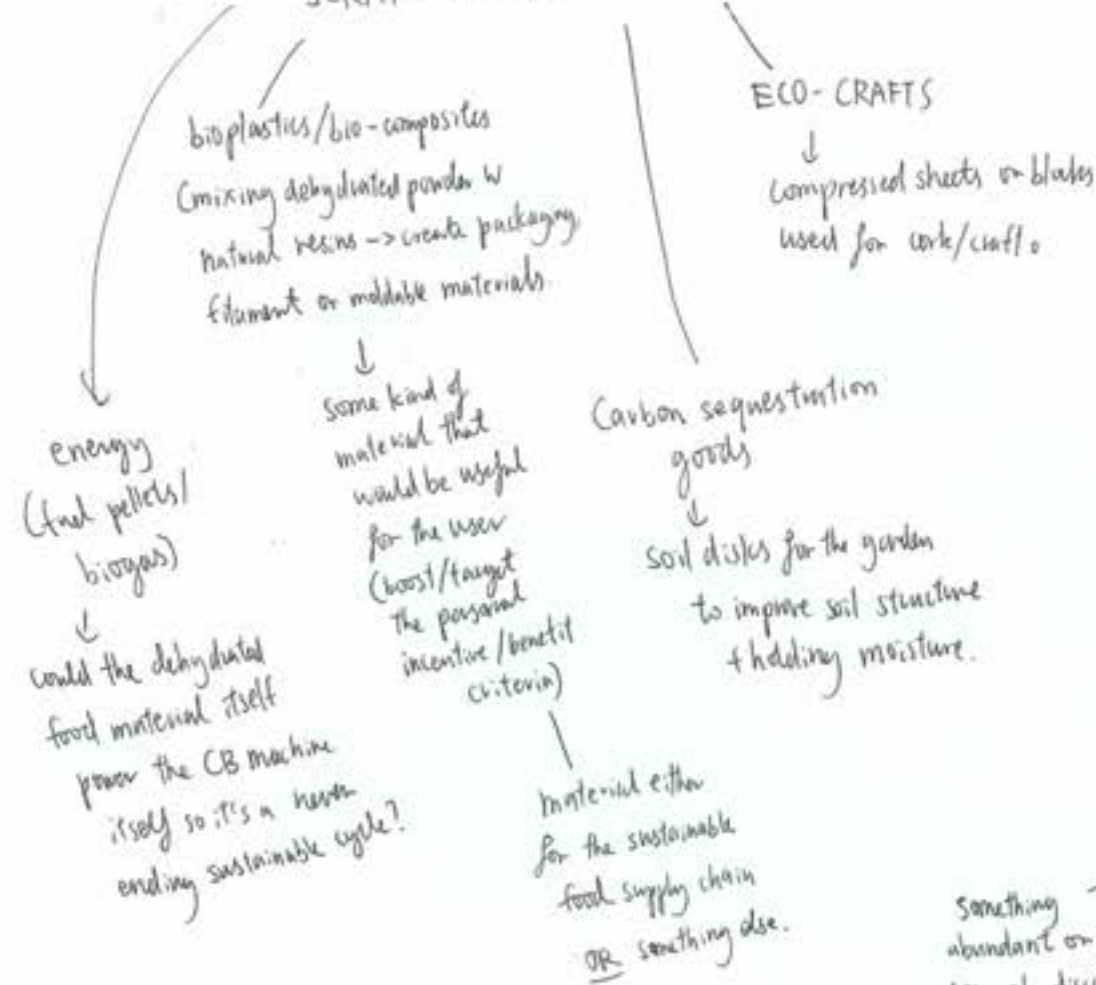
IDEAS!

- where can the finished compost soil go?
↳ busy individuals would prefer (likely to) having some storage where they can casually accumulate built up soil to use for when they need. (stay fresh/no oxidation?)
if they must be removed from machine every time, or it's time consuming or messy, they may be discouraged to keep using the compost bin altogether.
- could they be transported automatically?
- provide a larger soil storage bin that works as a set?

- would they actually use the compost soil?
↳ would they even have a garden/plants?
- is there an alternative/could dehydrated food scraps be used for anything else? capsules?

COULD ANYTHING BE DONE/ MAKE USE OUT OF DEHYDRATED FOOD SCRAP MATERIAL?

they are useful for reducing
food waste volume & = reducing
GHG/methane
BUT it's not real compost
and doesn't benefit plants/garden
much at all.



BENEFITS OF AN ELECTRIC COMPOST BIN FOR BUSY YOUNGER DEMOGRAPHIC

— especially for
ppl living in apartments
& don't have an outdoor
garden, ECB is a good
option for composting indoor

in Brisbane
that may not be much
of an issue as it can
be taken outside.

↓
waiting for food waste
to be picked up but it's
smelly inside the house
↓
convenient by simply throwing
waste into a ECB

↓
additional features/
add-ons-
eg: • activated charcoal
filters
• sand dust
• new rubbish bag
lines to keep
bin clean
& reduce the need
of cleaning/
maintenance.

POTENTIAL INGREDIENTS + PRODUCABLE MATERIAL

Ingredients	Material ideas
- egg shells	- tiles
- coffee ground scrap	- 3D printing filament
- onion skins	→ exfoliating soap bars (coffee grounds + beeswax oil)
- nut shells	→ + starch → odour absorbing pellets
- banana peels	
- citrus peels	→ + vinegar = cleaning agents or scent diffusers (fermentation required)
- potato peel	→ plus gelatin → thin biodegradable plastic sheets → cling wrap.
- herb stems	
- celery bases, cabbage leaves, leek tops + broccoli stems	→ fibres can be pulped, dried + pressed ↳ handmade soap paper.
- beet skins / onion skins	→ natural colouring addition.
- pulverized eggshells	→ calcium solution (fertiliser, cleaner, food fortification)
	→ vinegar

Something
abundant or
commonly discarded
would be
useful

or on top of that,
maybe an ethylene
absorbing effect?

machine that
only takes a certain
material type/shape
& certain
new material



eg. egg shells
coffee grounds

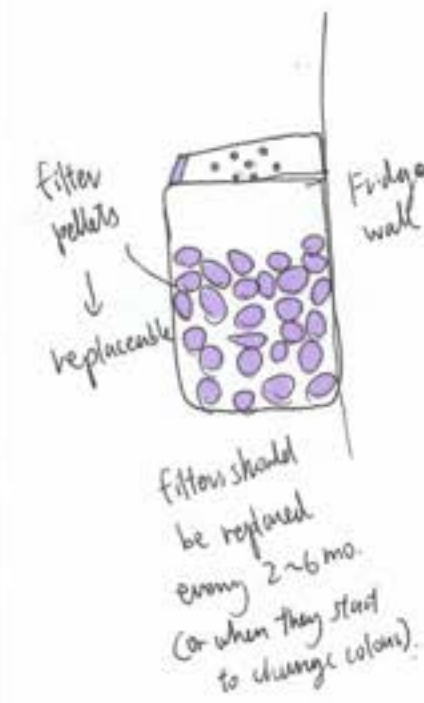
combines the scrap with
another material eg charcoal
→ fridge odour filter.

hello@wowme.design.

FRIDGE FILTERS

(either odour or ethylene gas absorbing OR both)

A system where ingredients → coffee ground scraps + starch + activated carbon granules (odour absorption) + potassium permanganate (for ethylene gas absorption) is all mixed together and produce pellets / capsules of filters to put inside the fridge.



Sell a sealed cartridge storage box as a set → more household waste = more pellets & they only need to be replaced every few weeks/months = extra unused pellets can be stored and used when they need replacing.

Should I make two sections within the machine - one - odour absorbing, two - ethylene gas absorbing?
or all in 1? (if that's even possible)

naturally odour absorbing before even charring, widely available + already porous, high in carbon, easy to char

food waste / scraps

- coffee grounds
- tea leaves
- leftover rice
- potato peels
- bread crusts
- onion skin
- garlic skin
- veg scraps (corn husks, broccoli stems, cabbage stalks)
- eggshells

starch chars into porous carbon & is plentiful + consistent.

high in cellulose / lignin which creates a strong char structure. also dries quickly, chars easily + produce neutral biochar

mostly calcium carbonate but the membrane chars into useful material
alkalinity = neutralises acidic odours.

all the listed food scraps are effective enough to neutralise odours alone!

BUT we still need an ingredient to bind / stick them all together. and to ~~boost~~ the odour absorption even more, baking powder should be mixed in as an additive.

odour absorbing

- baking soda / powder (very affordable + abundant, accessible)

ethylene gas absorbing

- $KMnO_4$ (potassium permanganate crystals)
- Zeolite

pick one

no chemicals involved and all natural, not as fast performing as $KMnO_4$ but is much safer.

more harsh chemicals. have to be careful with putting on labels & washing on how to dispose very effective, used commercially. - also starts changing colour from purple → brown. easy indicator to replace.

either
• starch paste - potato peels, rice (very common + accessible)
• flour / wheat paste - easy + cheap, found in every household.

- additive, not binder.
- makes pellets more effective at capturing acidic odours.
- abundant, easy accessible and affordable.

competition for pores (adding too much baking soda or binder physically blocks zeolite / biochar pores = reduced ethylene production).
odour neutralisation uses adsorption (char + carbon) + chemical neutraliser. Ethylene removal mostly on adsorption is small micropores.

humidity / chemistry
- baking soda & starch can attract moisture & change pellet behaviour. zeolite likes dry conditions to adsorb gases. exposure to moisture can reduce effectiveness of both in different ways.

Thought about combining both into the same pellet but would be less effective = 1

ODOUR PELLETS REQUIREMENTS

- ↳ charred / dehydrated food scraps
- ↳ binder → starch / flour
- ↳ odour absorbing booster
↳ baking soda.

ETHYLENE GAS PELLETS REQUIREMENTS

- option 1 (chemical + more effective)
 - ↳ biochar from food scraps
 - ↳ potassium permanganate ($KMnO_4$) crystals
 - ↳ binder - starch
 - ↳ tightly sealed storage ($KMnO_4$ is a strong oxidiser and should never be touched directly)
- option 2 (safer)
 - ↳ zeolite (natural clinoptilolite (food grade))
 - ↳ biochar from food scraps
 - ↳ binder - starch

SUMMARY OF FRIDGE FILTER CONCEPT

ODOUR PELLETS REQ

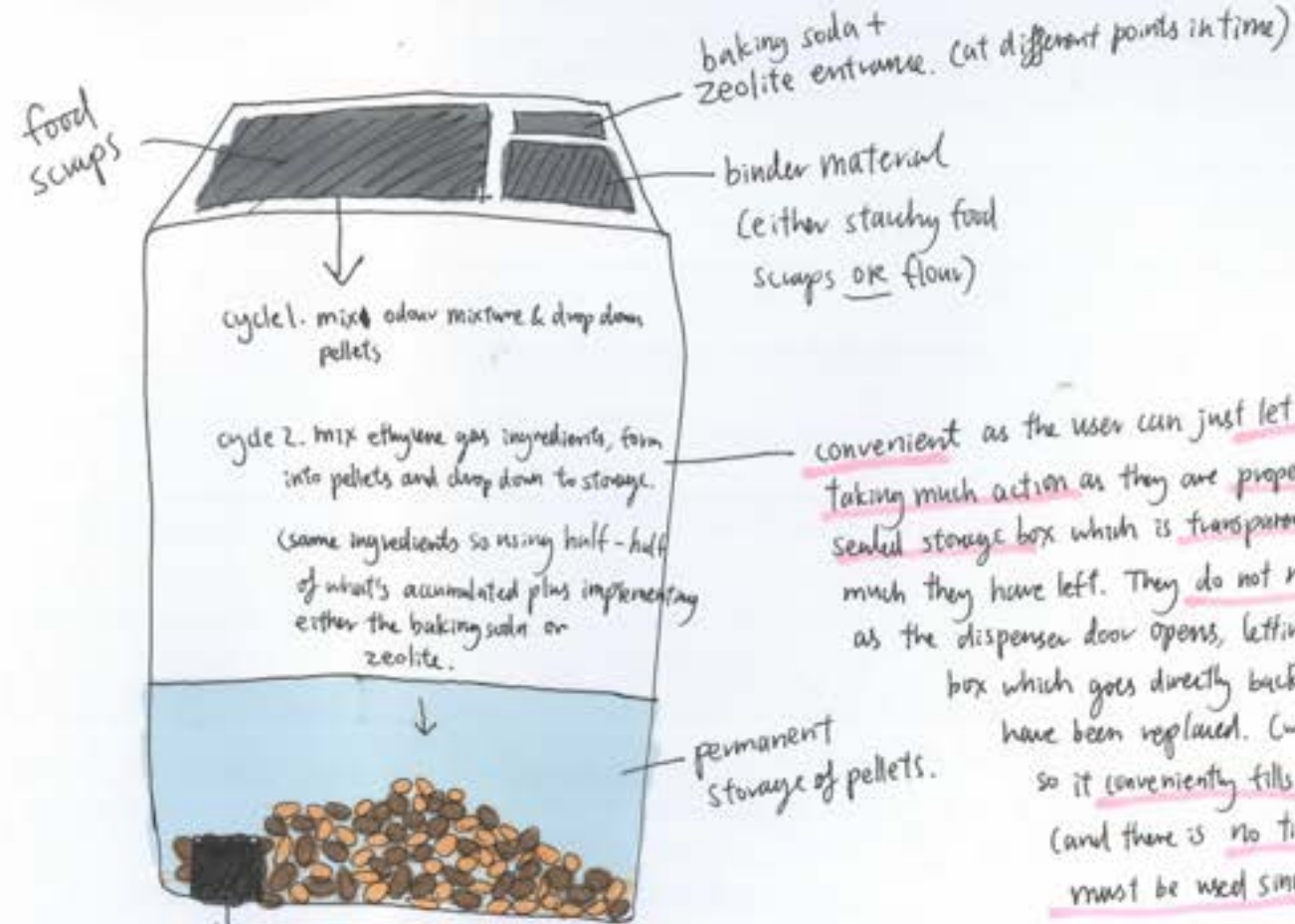


- food scraps → charred or dehydrated.
(eg. coffee grounds, tea leaves, onion skin, potato peels, egg shells)
- binder material → either starchy food scraps
(eg. potato peels, rice) or flour.
- odour absorbing booster ingredient → baking soda.

ETHYLENE GAS PELLETS REQ



- zeolite (natural clinoptilolite)
- food scraps → charred or dehydrated
- binder material - starchy food scraps or flour.



convenient as the user can just let it accumulate without taking much action as they are properly stored in a tightly sealed storage box which is transparent so they can see how much they have left. They do not need to be directly touched as the dispenser door opens, letting pellets drop into the filter box which goes directly back into the fridge once insides have been replaced. Which happens semi-frequently, so it conveniently fills up slowly but more than needed. (and there is no time limit on how fast the pellets must be used since production.)



effectively + safely maintains the cleanliness + odourless environment in the fridge with

- low effort
- easy replacement of pellets
- very cost effective
- convenient (do not need to take action every time user & it's there waiting for when you need it.)
- reduces food waste + scraps (the volume)
- = reduces GHG + methane gas released into atmosphere
- = less messy rubbish to touch and deal with taking out (gets processed on the spot in the comfort of your own kitchen)

MOST DOABLE IDEAS

beauty product
using coffee grounds

fridge odour +
ethylene gas absorbing
filters/pellets.
(coffee grounds + starch)

cleaning agents /
scent diffusers (vinegar +
citrus peels)

cling wrap (from
potato peels +
gelatin)

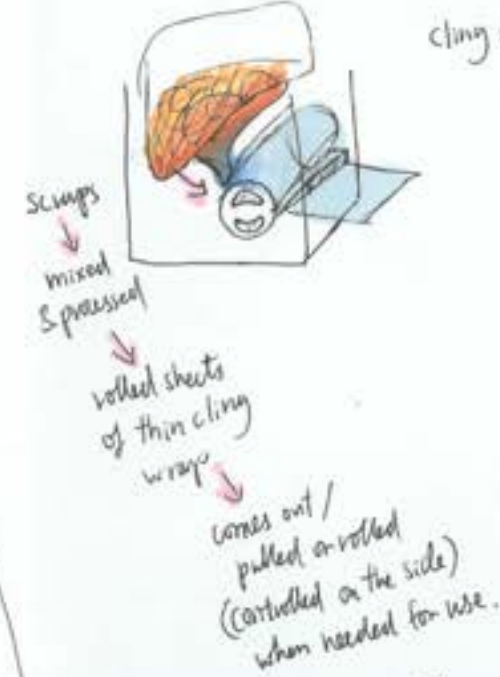


CLING WRAP

(potato peels +
gelatin)

- sustainable
- abundant
- guilt free natural +
well sticking (good
quality + performance)
- no cling wrap waste.

- cling wrap →
- plastic pollution
 - difficult to recycle
 - takes hundreds of years
to decompose
 - leach harmful chemicals
like plasticizers/dioxins
into food (especially
when heated)
 - during the break down process, it creates microplastics which
further contaminate the environment (and can be mistaken
for food by animals)



ingredient mixture exploration

potato peels + gelatin

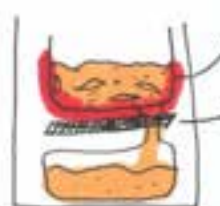
- contain starch (backbone of bioplastics)
- provides protein chains that give flexibility and film forming properties.
- + glycerin → plasticizer making the sheet bendy instead of brittle.
- + heat & drying → transforms the slurry into a thin, transparent, cling wrap-like film.

1. Collection & Prep



add potato peels
into machine
after washing them.
the starch is mixed
with water to
create a gooey
liquid mixture.

2. Starch extraction



heated
filtered to take out
any solid peel pieces
(filtered out material
could end up in a tray
for user to toss later)

4. Casting the film



either spreads the liquid into
a thin flat layer on a tray
or another method to feed
into thin long sheets



dried / dehydrated
into cling wrap.
(transparent +
flexible sheet)

3. Film solution making



The extracted starch are
mixed together with gelatin,
glycerin & water and are
heated together.
↓
turns into a thick, gooey
liquid (similar to bio-
plastic resin)

machine
process

5. user peels off the wrap which is ready to be used
to wrap foods or cover them. They are compostable
after / is biodegradable = closing the loop.

but too many
ingredients required
= too complex
& hassle some
= not worth the
effort & time
required.

potentially
add beeswax
as an additional
ingredient?

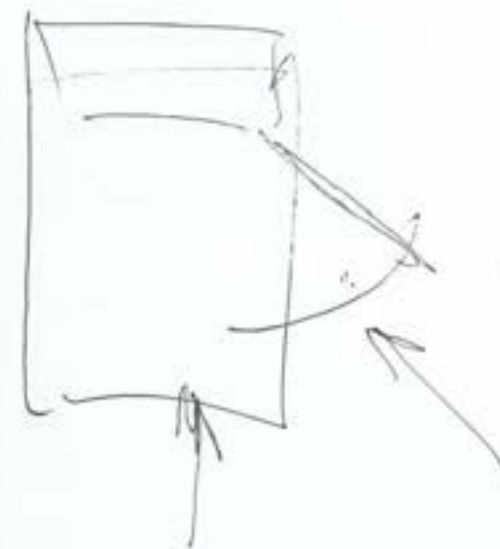
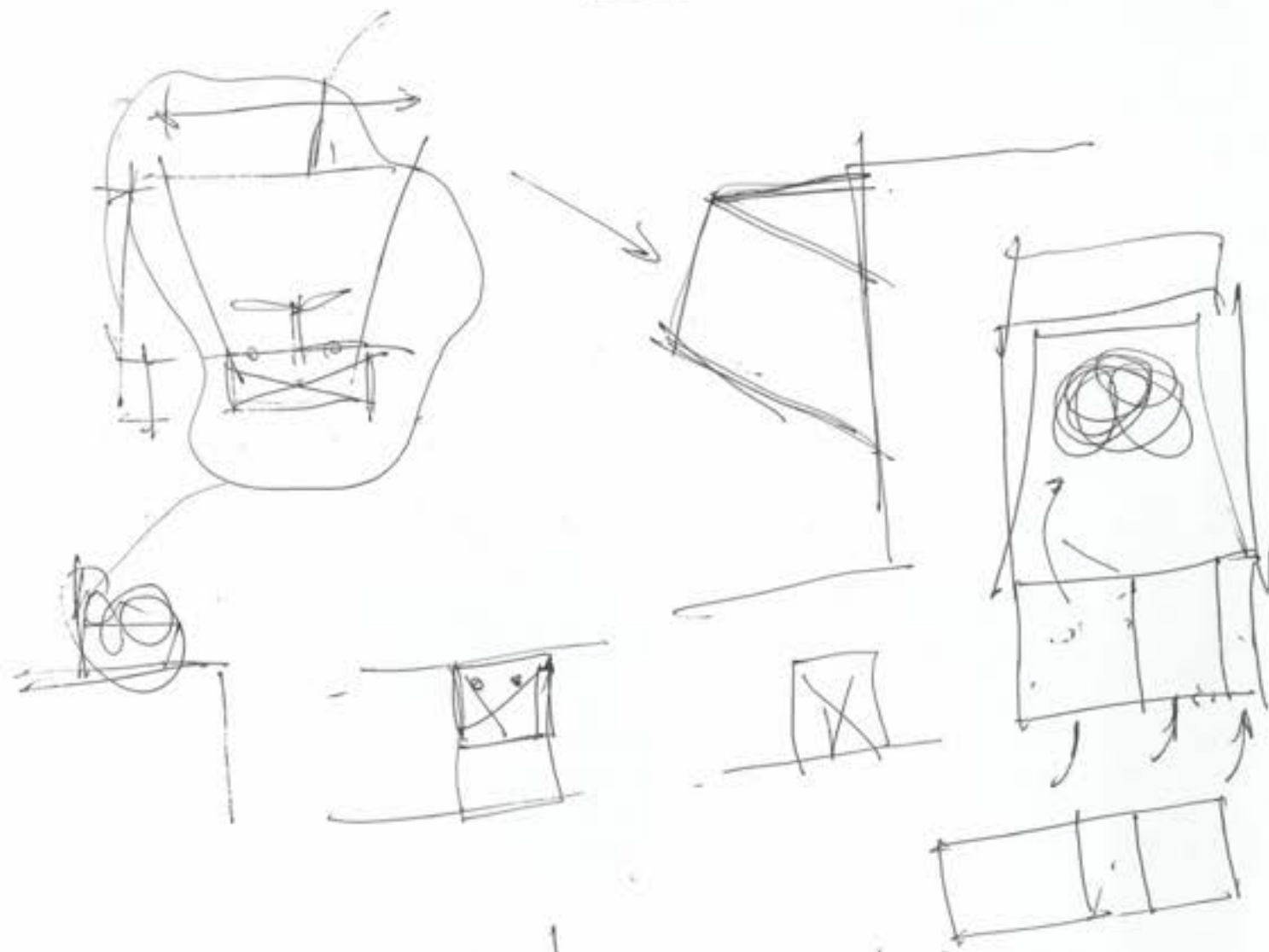
CHALLENGES

- films from starch/gelatin
could dissolve in high
humidity
- potato peel content (in
starch) can vary.
- produced cling wrap must
be food-grade / safe

BENEFITS OF THIS CONCEPT

- fully biodegradable
& completely natural
- close to cost free.
- no harmful chemicals
entering wrapped food

ANTON'S DRAWINGS



2 ingredient
"COMPOST"
bin.
to make a
new material/
product.

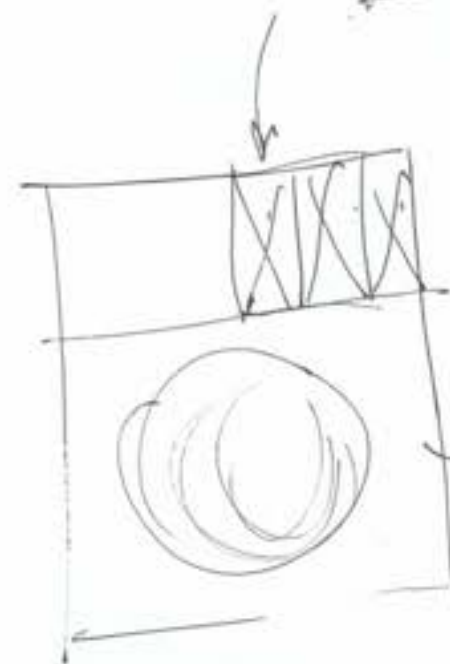
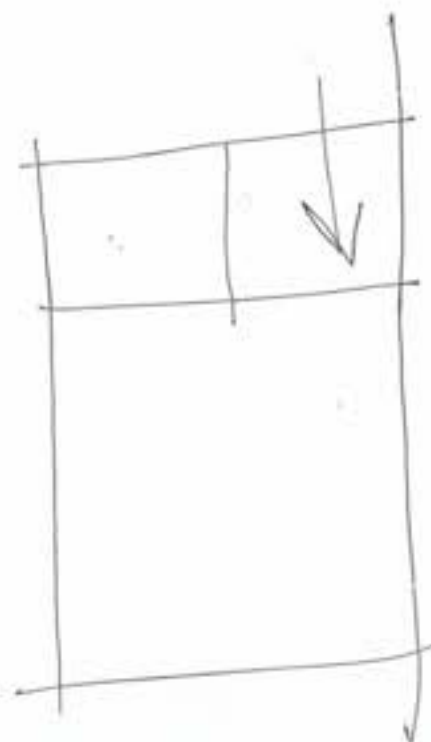
food
scrap

slot or pour
in the other
material
ratio
eg. paper/
paper/
scent material



finished product
comes out

do they
come out automatically?
or when user notices?
or can they be stored/
accumulate in there?



inspired by
washing machine

ingredients

egg
shells
coffee
scrap.

ceratin
scrap
input

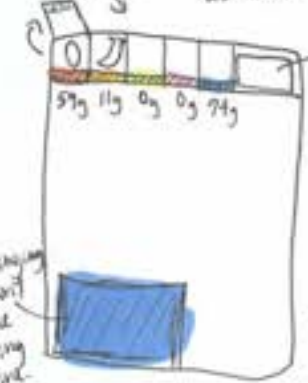
another
material

paper
scraps

activated
charcoal

nice odorous
small pellets/scent addition.

slots/drawers for variety of
food scraps (ready to use ingredients
but without causing odors bc they may be
stored there for a while while waiting for
accumulation).



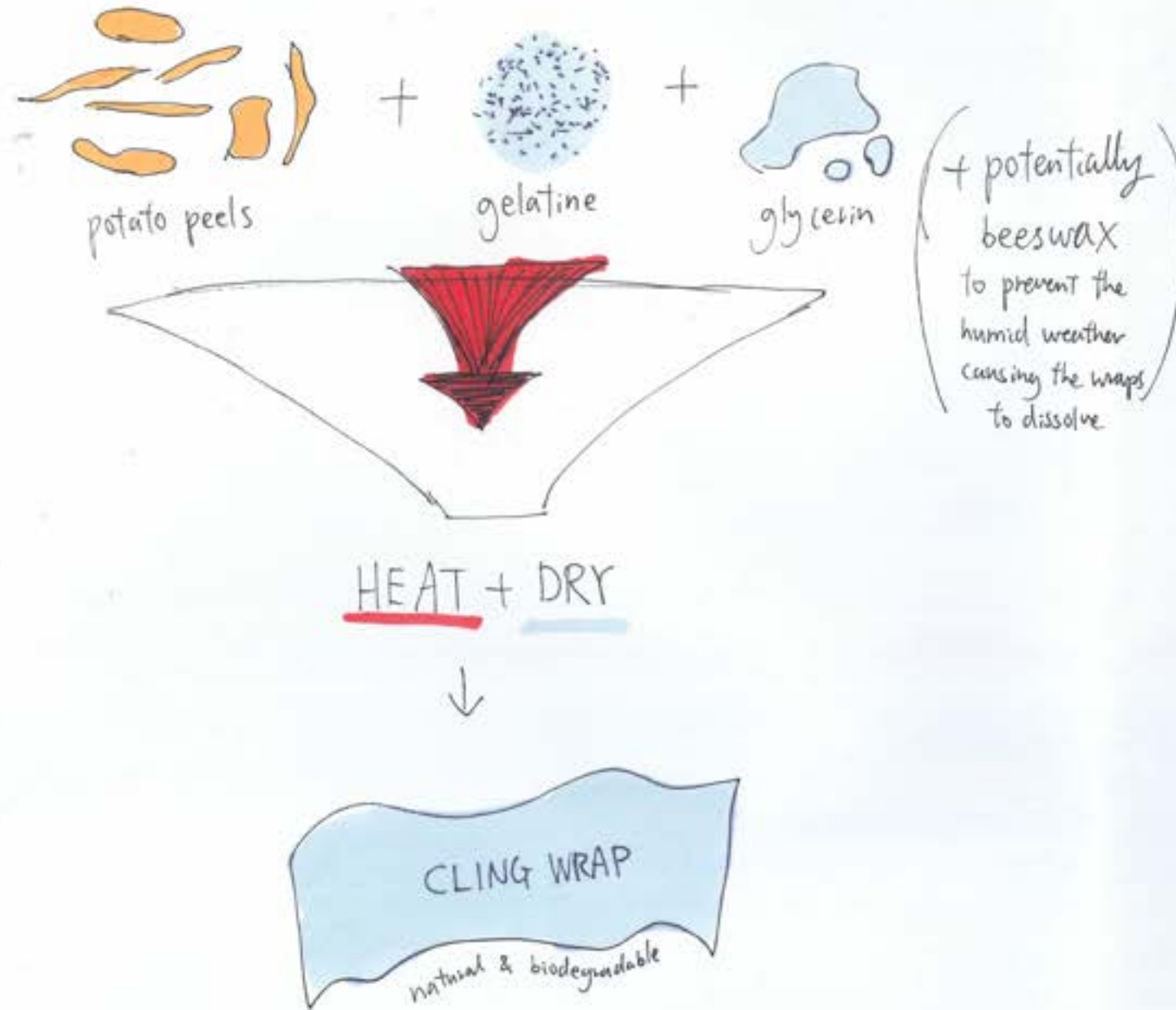
additional
mixing material

HOWEVER IT WORKS

- store multiple
scrap ingredients
in the allocated
door/storage
- select certain ingre
to produce chosen
new material.
eg soy of eggshells
soy of =

a swinging
back/front
door like
a vending
machine

CURRENT PLAN



TIME TO EITHER TEST FEASIBILITY OR
ADJUST INGREDIENTS/PROCESS.

What is the required
amount and ratio
of all the ingredients?

? : ? ? %

would this process
work at home without
any industrial/machine
help?



other research articles
mentioned the use of
the following ingredients:

- date pits/seeds
- pectin
- plant gums
- proteins
- corn starch
- cellulose
- pullulan
- starch (cereal)

potential
key words in this experiment

- tensile strength
- swelling index
- water solubility
- water vapour permeability
- elongation capacity
- morphological properties
- biodegradable

cheap, accessible,
found in every
household

BENEFITS OF USING BIODEGRADABLE CLING WRAP PRODUCED FROM FOOD WASTE OVER SYNTHETIC, COMMERCIAL ONES.

- biodegradable = break down naturally & reduces landfill waste
- less microplastic pollution in water, soil & food chains
- upcycling food waste = giving them a second chance at life as well as reducing volume of food waste = reducing greenhouse gas + methane
- lower reliance on virgin fossil resources + supports renewable material cycles.
- no harmful chemicals/additives = safer for the food being wrapped (especially when microwaved or heated)
- biodegradable films can improve quality & extend shelf-life of fresh, processed & minimally processed food products. (protecting food from physical damage, moisture, vapour, microorganisms + more = preventing rapid spoilage.)

ACCORDING TO THIS RECIPE, THE DRAWBACK IN COMPARISON TO COMMERCIAL CLING WRAP:

don't want to
use too many
ingredients bc this
would become too
effort consuming for
the user.

- weaker in strength (stretchable but tear more easily)
↳ could be solved by beeswax ~~or citric acid powder for strength~~
- not as sticky (there's no static charge or surface chemistry like commercial ones)
↳ use citric acid to stick better
- more sensitive to high humidity, steam & liquids.
↳ can't be solved but improved by beeswax additive.
- not transparent, only semi-transparent → not a huge issue but some users may consider this a deal breaker.

Other challenges

- drying must be quick or it would be too time consuming for the user to bother.
- hard to control thickness throughout the whole sheet (too thick = sticky & messy, too thin = easily tear)
- may be an issue to smoothly & effortlessly remove the final sheet off the mold/surface (may be very sticky)

STEP BY STEP OF MY EXPERIMENT

1. peel off the skin off potatoes.
I ended up with 110g of potato peels so I adjusted the ingredients accordingly.
2. Blend the peels with 300ml of water til you can't see any big chunks (approx 30secs) & until you have a smooth slurry.
3. Strain through a very fine sieve (I repeated 3x)
(get rid of all the foam + bubbles)
4. Let it sit 30~60 minutes. (white starch settles at the bottom)
5. keep the white starch at the bottom while throwing out the water.
(Approx 11g of dry starch should remain)
was supposed to become dry + rough but didn't
6. GELATIN - mix 2.8g gelatin with 20ml of cold water & let it sit for 5~10 minutes.
wasn't sure if I had the right temp. no device to check.
7. Add the extracted starch paste to 220ml of water in a pan and heat gently to 70°C ~ 80°C. Stir until it thickens + turns translucent.
(5~10 min)
seemed to thicken a TINY bit but not very much which was concerning. (after 10 mins)
8. Add the gelatin mixture into pan and lower heat to 60°C til gelatin dissolves. Then add the GLYCERIN - 4.1g and stir until smooth.
even after this no further thickening happening. Decided to add 2 teaspoons of cornstarch to see more promising results of thickened texture ✓

9. Melt 2g of BEESWAX and whisk it into the mixture.

10. Turn off heat and let mixture cool for 2~3 minutes.

If any bubbles form, gently skim or let it sit 5 minutes.

11. Pour the warm slurry (50°C) onto a clean silicone mat (1mm thickness) using a spreader rod.

12. Put the mat & slurry itself into the oven with the door ajar set to 50°C. - no hotter bc it can cause bubbling, uneven shrinkage or cracks. For 4 hours.

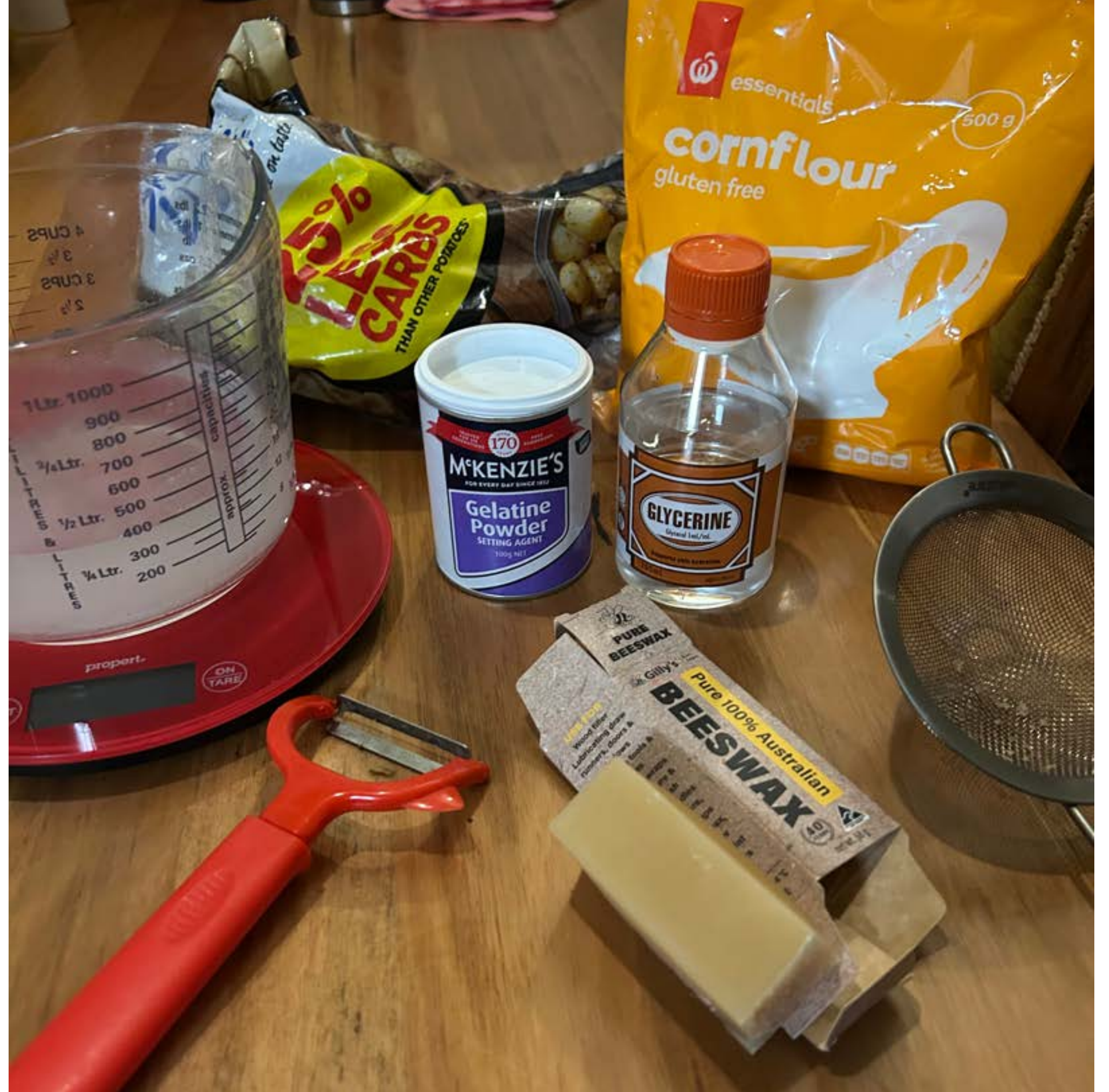
what's expected → 0~1h - surface still milky, glossy liquid

2~3h - Edges begin to dry but the centre has not set yet.

4~6h - surface turns more matte; top dry to touch.

Things I observed 

INGREDIENTS & UTENSILS





Preparing potatoes and start peeling the skin



Weigh the peels and put into a blender, measure water and put the perfect ratio to blend (refer to recipe for measurements)



Blend for approx one min until its smooth



After ensuring its smooth and there are not peel pieces unblended, pour it through a strainer and discard all the foam and leftover fibres



Strain through the sieve multiple times to ensure only liquid remains. Leave for 1 hour



After waiting, slowly and carefully pour the water to discard to see the remaining starch



Mix gelatine with water and stir. Let it sit for 5 to 10 mins



Mix the remaining starch mixture with new water and heat til thick



Cut beeswax, microwave to melt and pour this and the gelatine mixture and glycerin into the pan



When it's turned very thick, mix well and pour onto a silicone mat to cool



Spread the mixture so it's 1mm thickness (but it was very hard to keep even)



Make it 50 degrees and leave the sheet for 4 hours



Came out very cracked and would need adjustments to the recipe to recreate cling wrap



It wasn't a complete failure as it did come out solid, dry and quite stretchy and soft in the middle part which was cooked a little less.



Thankfully there was a single part which was big enough to be used for a cling wrap alternative demonstration. As you can see it's stretchy



For better or worse, the edges were durable and hard but easily cracked and were not stretchy at all



Final measurements were accurate to what the recipe predicted. 1mm sheet 17cm x 24cm

AFTER DOING THE EXPERIMENT!

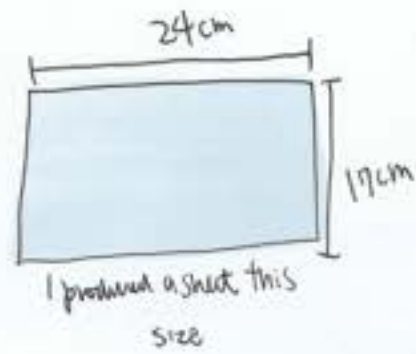
Did it go well and smoothly? - yes and no. Not everything went to plan, but I was able to produce a cling wrap like sheet in the end.

PLANNED INGREDIENTS:

- 110g potato peels
- water
- 2.8g of gelatin
- 4.1g of glycerin
- 2g beeswax

UTENSILS:

- bowl
- blender (smoothie)
- sieve / strainer
- vegetable peeler
- measuring cup
- scale
- spoon
- pan
- clean silicone mat
- spatula
- + oven
- + timer



what I wish I had to make it smoother process /
what I would change / limitations & constraints
in my observation.

- was unexpectedly time consuming + required patience → especially during the 30~60min wait for the initial starch separation process. & 4~6 hours in the oven.

- The recipe said to pour the extracted starch onto a plate / paper towel so it becomes dry & rough but the water never evaporated and remained after a good while so I just used it as they are.

- The recipe suggested exact temperatures to keep the heat on the stove but I didn't have any tools which could measure this so I just winged it + hoped for the best ✓

- either this was the issue or it wasn't going to work either way / something else was missing → to see some kind of result / reaction (because the heated mixture needed to thicken, what's the point in putting thin liquid in the oven for it to dissolve into nothing!) → I added 2 teaspoons of cornstarch which I found in my pantry → mixture rapidly thickened! ✓

- was very difficult to spread the slurry on the silicone mat to be very evenly distributed. Maybe required a wider tool.

- 4 hours was too long and I could only keep the oven on for 3 but was surprisingly enough to form into a plastic like material. especially the edges were very thin, hard, durable and leather like.

↓
edges strong but no longer stretchy or sticky AT ALL.

↓
the middle + close to edge were not as strong but were stretchy, very sticky, and may be slightly more suitable.

→ maybe a combination / meet in the middle for best result → 4 HRS from real recipe. (to get the middle to solidify a tiny bit more)

- after observing post oven-heated, the edges were all completely cracked. → may have been spread too thin?

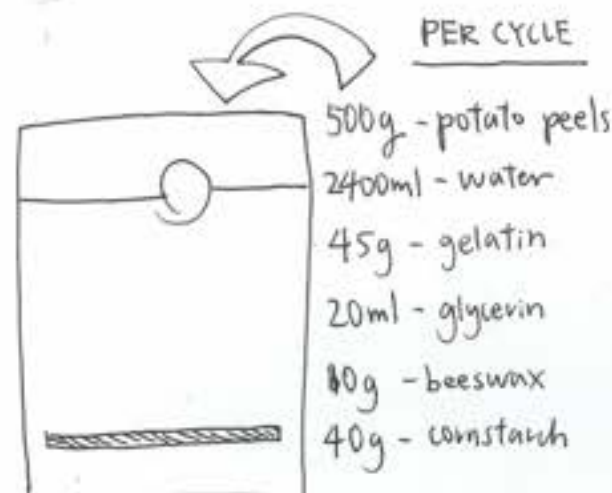
In conclusion I wasn't sure if I got a lot of the recipe correct & accurate as I was missing key utensils + tools & it was also difficult to understand how the chemical process works exactly, and which parts were important and had to be done accurately for proper results (if not all of them...)

BUT! overall I consider this a useful experiment and a success. It has been confirmed that the recipe does work and just needs a few adjustments to ENSURE it works.

FINAL RECIPE (for the compost machine)

(or potato cling wrap machine,
gotta come up w a funny
name later!)

$$\begin{aligned} 500g &= 0.5kg \\ \text{Volume} &= 0.5kg / 246.25 kg/m \\ \text{Volume} &\approx 0.00203m \\ 0.00203m \times 1000L/m &\approx 2.03L \end{aligned}$$



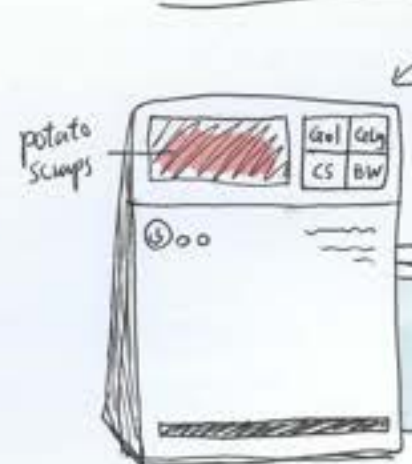
500g - potato peels
2400ml - water
45g - gelatin
20ml - glycerin
80g - beeswax
40g - cornstarch

CAN TAKE UP TO

4L of food scraps (potato peels)
(but only process 500g (2L) at
a time per cycle. = user can keep
filling it up until it fills 4L worth
and process 2L into cling wrap at
a time.

500g of potato peels
↓
take up about 2L
worth of volume.
x2.

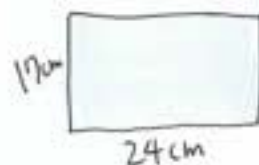
PER MACHINE CYCLE



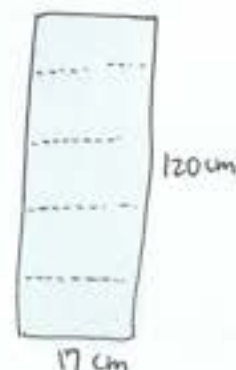
gelatin, glycerin,
cornstarch +
beeswax allocated/stored in different
containers as the chemical process involves
a specific order. BUT the user does not have
to worry, as the machine sorts it & uses it
in proper order during the making of the wrap.

Water is added inside
machine from here. holds
2.5 L of water.
(enough for one cycle)
(did not want machine to be
overly big or bulky).

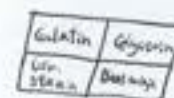
In the experiment, the mixture produced
17cm x 24cm cling wrap with approx 20%
of the ingredients (that the
machine will process at once)
just to test the potential +
chemical process & improve
or adjust it.



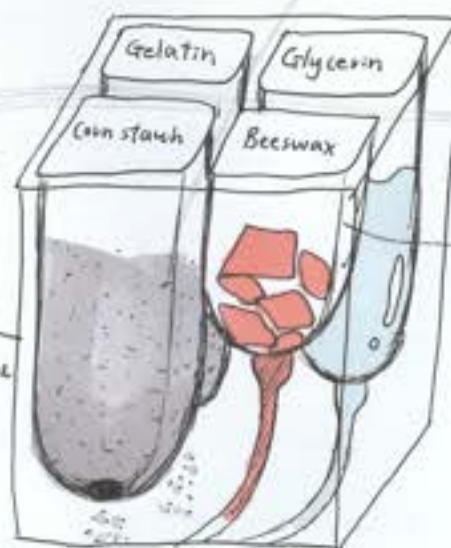
$$\begin{aligned} 24 & \times 5 \\ &= 120cm \times 17cm \end{aligned}$$



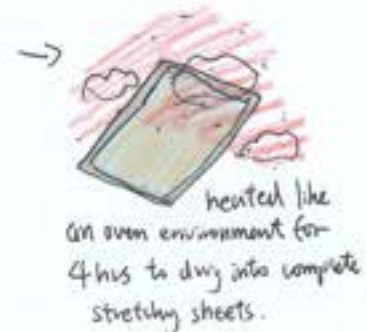
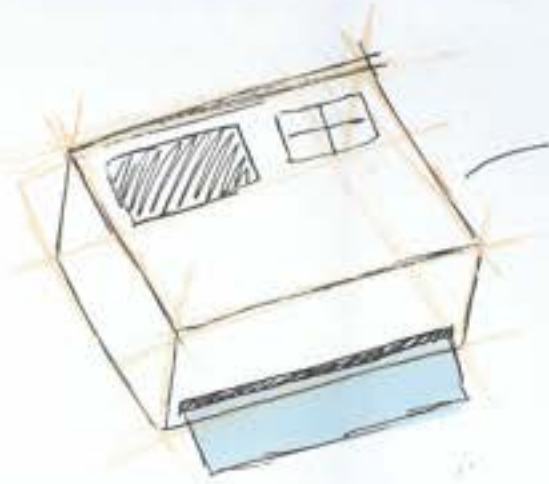
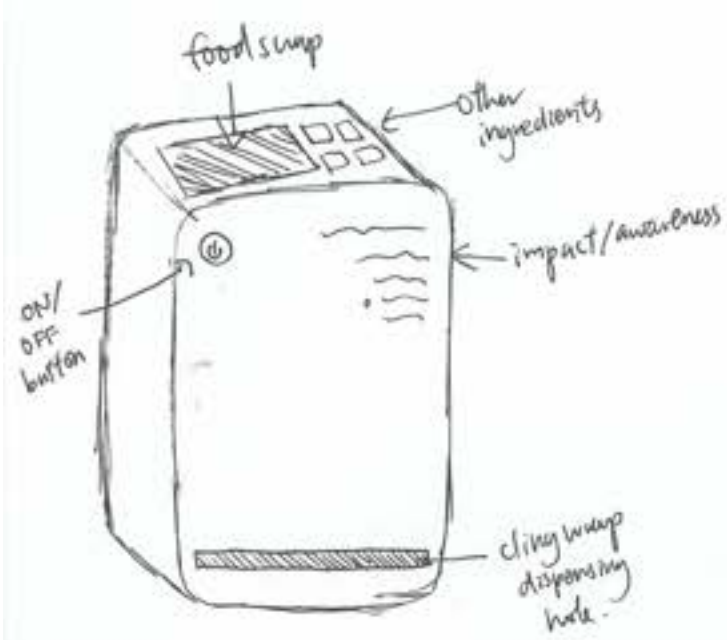
At a press of
a button, (and
minimal prep
by the user)
the machine can
produce a sheet (rolled)
the length of 120cm
with the width 17cm.
(Should last a week ~
few weeks)



the machine stores all
necessary ingredients
all at once - long term,
so the user can fill
it up once, and should
last many many machine
cycles. convenient
and easy to rely on!



beeswax bottle would heat up,
melting the wax and allowing
it to travel down to the mixture
(the remaining wax would solidify
again eventually and be melted down
each time a portion is needed)



when machine completes the whole roll, it keeps it in the machine until each diameter is used.



discovery from experiment!
keeping the final dried (oven) sheet out in the atmosphere makes it hard, thin, dry and not stretchy at all. prone to tearing apart & basically unusable as cling wrap after about 48 hours. (may be due to the beeswax component)

Aesthetics + features to implement

- visual/written awareness factor

\$ saved
— much CO2 prevented from being produced
• this cycle
• this month
• this year

— saving (financially)
— saving (reducing food waste + plastic waste = saving wildlife/planet)
— could make user aware of both?
— personal incentive is most important & motivating.
knowing you are directly contributing to better the environment (with measurable numbers or impact stats) it's more encouraging + rewarding for them to keep setting goals!

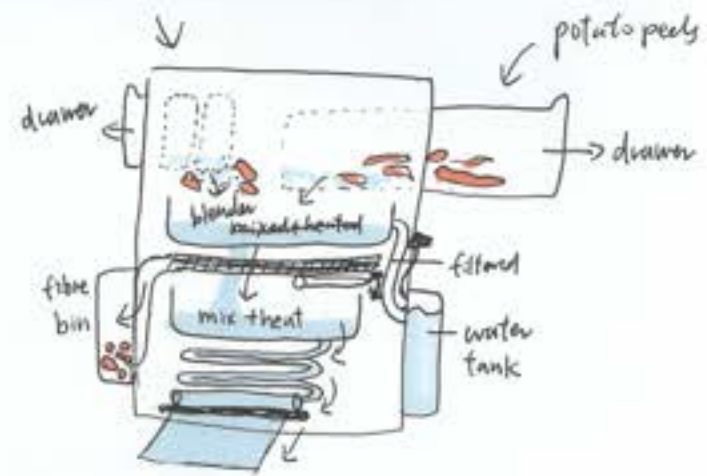
proper silicone/rubber sealant on food scrap lid = block odour + activated charcoal on inside of lid!

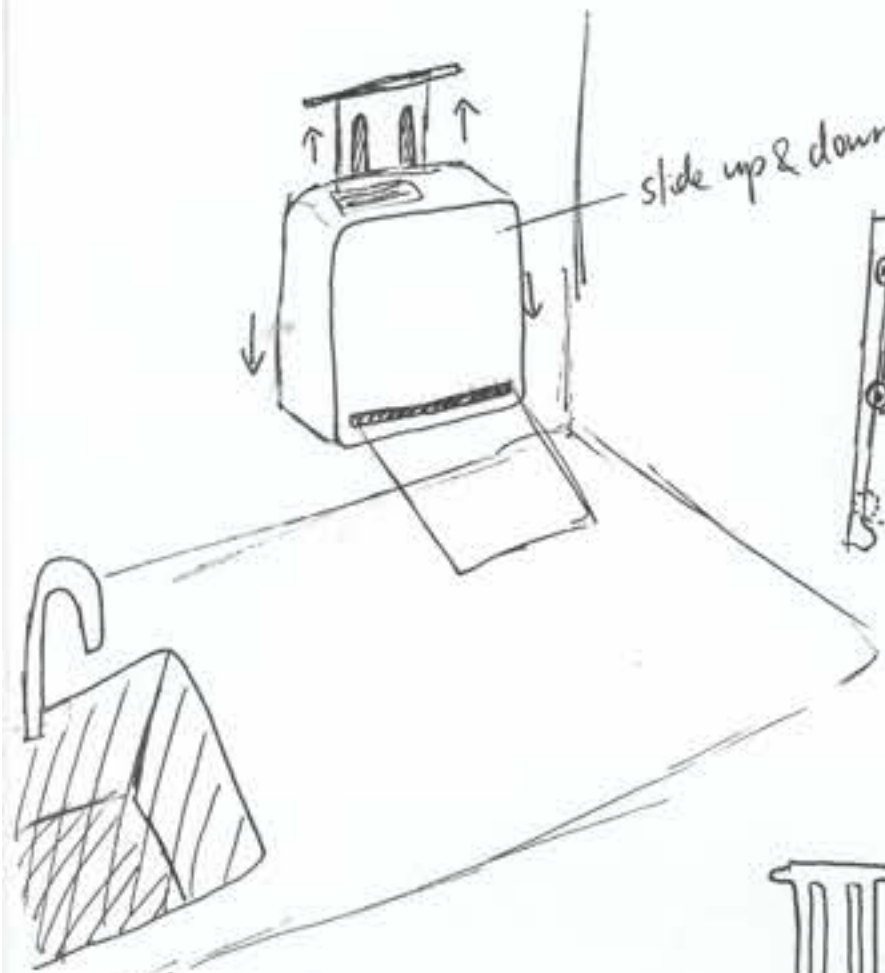
show capacity label

73% - potato peels built up for a single cycle

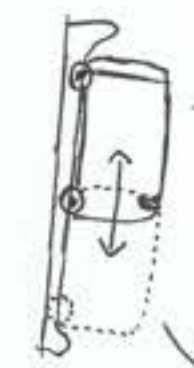
maybe not required for any other ingredient to prevent any complication/infusion. (just simply encourage user to keep those slots full at all times since they don't have a shelf life limit.)

retillable





slide up & down



at the top it's less in the way,
and stored nice & compact,
unobtrusive around an adult's
eye level.

at the bottom, the cling wrap that's being
released can directly be placed on top of
leftover dishes or wrapped in food with ease.
+ it's easier to pour food scraps in when
it's lower. (straight from chopping board).

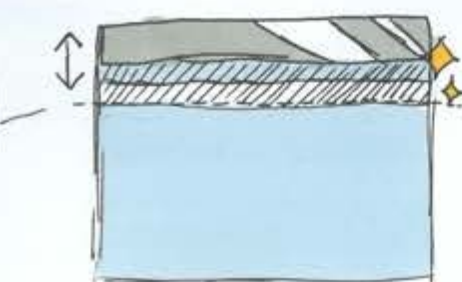


slider base will need to be directly
attached to wall which the machine
will be placed on. → then roll up & down
on it's wheels ~~and~~ & can remain up
or down (it clicks into place → nice and stable).
+ locked

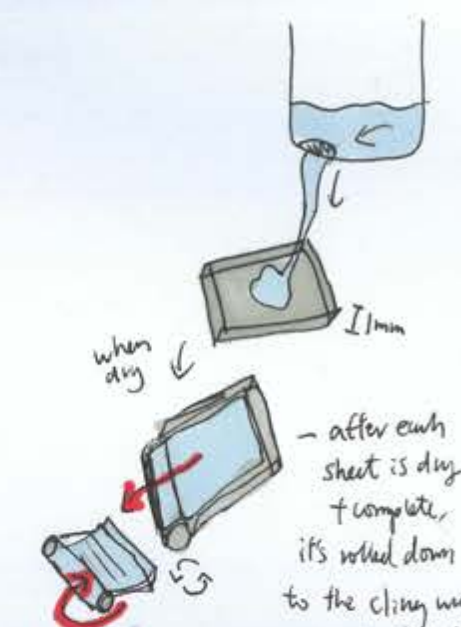


no messy pulling
on pulling sheet
against the blade
and the cut ending up
really messy like commercial
ones.

only take
what you
need!

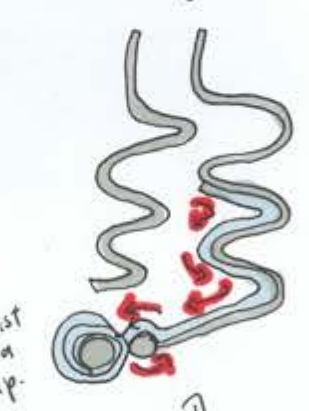
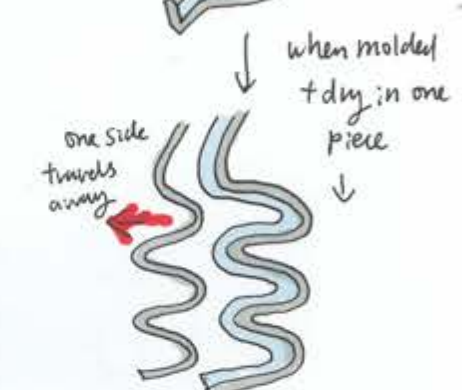


CLING WRAP MOLD



OR

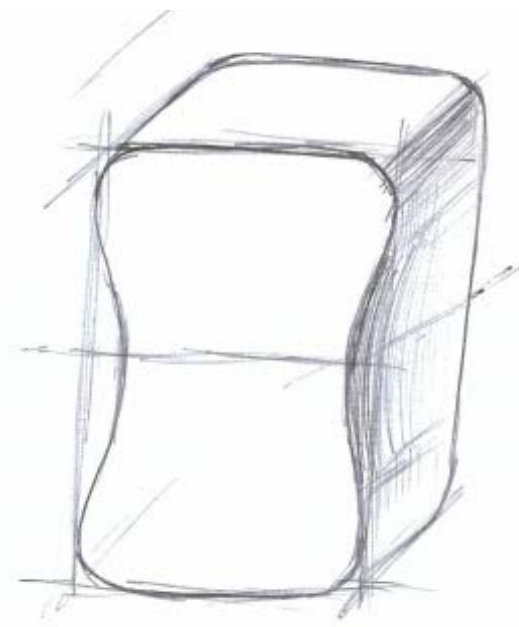
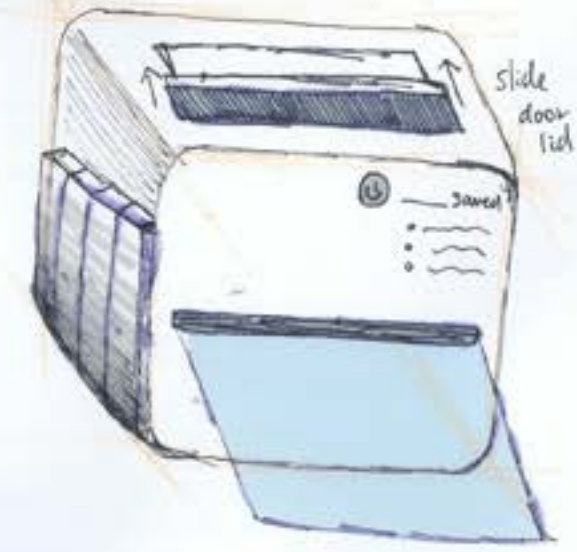
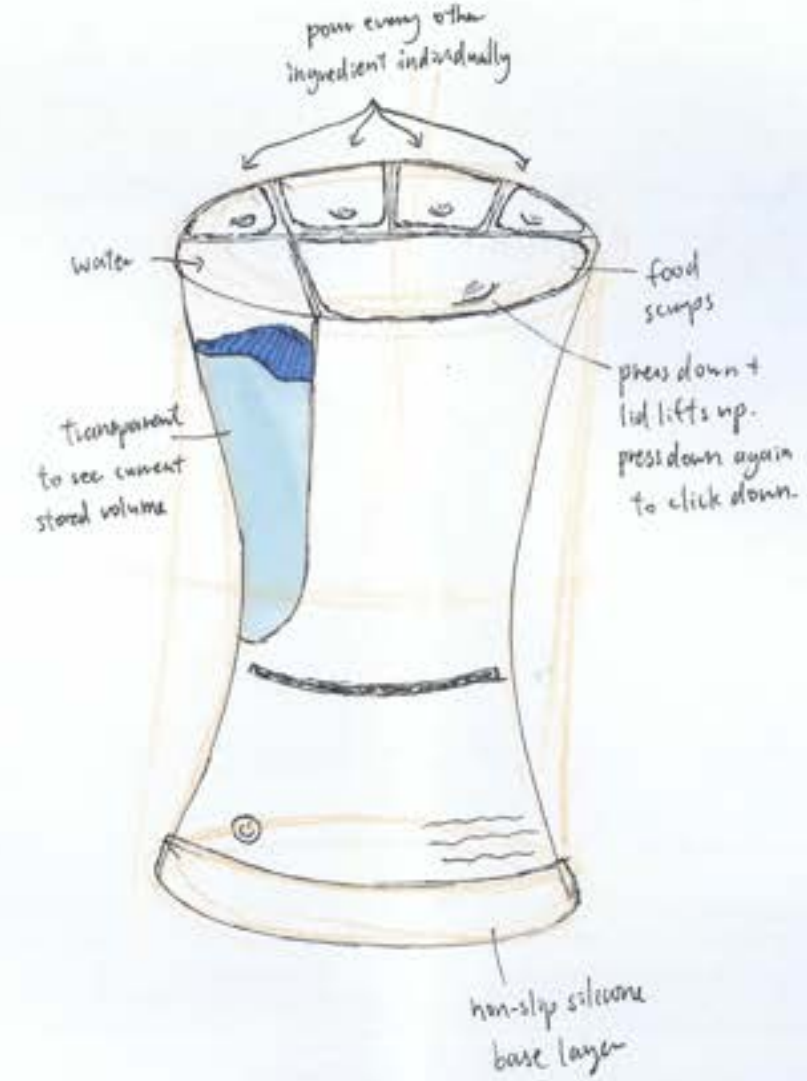
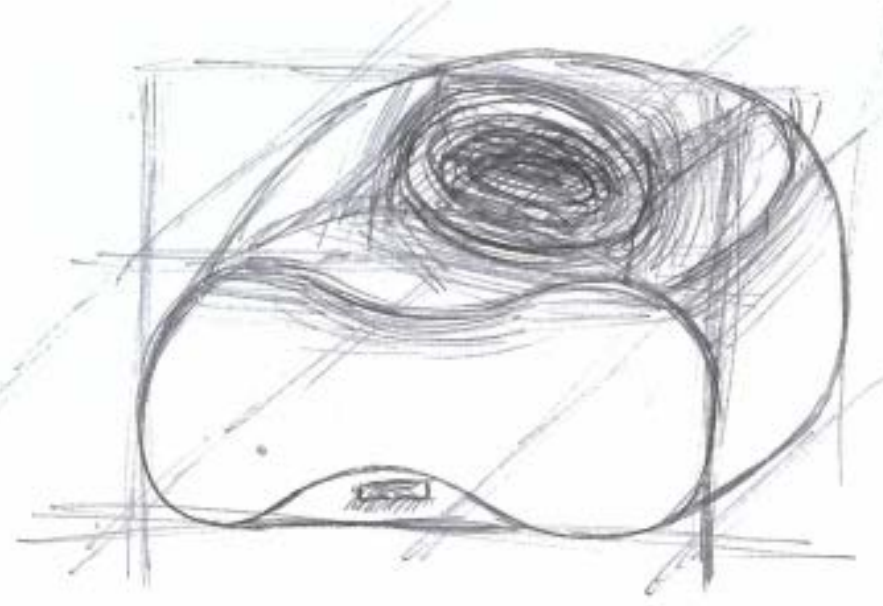
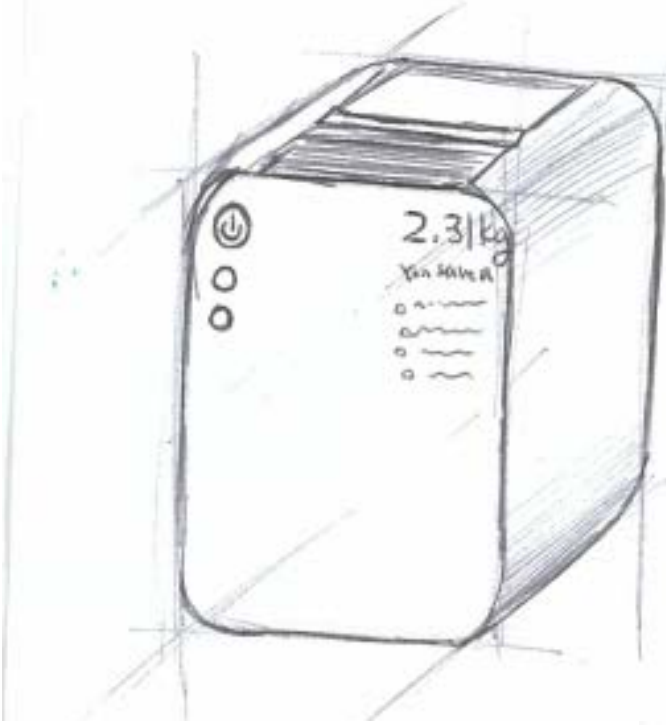
after each
sheet is dry
+ complete,
it's rolled down
to the cling wrap
roll below + all the
produced sheets are
rolled together to form
one piece eventually.



this is how the
sheet is formed
full 120cm x 17cm
length in one which makes
it easier to not have to
worry about combining
individual sheets into
a singular roll

and the
completed roll
stays inside
machine (nice and
moist but not hot
so that the sheets would
all stick together and
potentially melt &
become unusable)

per single
cycle.



each cycle uses 2L (500g) of peels at a time.

whole capacity is for two cycles so user doesn't have to immediately start process when full for 1 cycle.

each cycle uses 2400ml, 2.5 = prevent overflow or spills

2500ml vol. water

4.25L vol. potato scraps

capacity needed to make a cling wrap with width 17cm & length 120cm.

- water tank
- hole for pps
- hole/storage for other ing.
- charger/solar battery/plug
- buttons/interaction
- cling wrap

