Getting more value from food and drink by-products and wastes

A step-by-step mapping tool to prioritise and characterise food and drink by-products and wastes.

May 2017

In collaboration with

Lucid Insight

WRAP's vision is a world in which resources are used sustainably

Our mission is to accelerate the move to a sustainable resource-efficient economy through:

- Re-inventing how we design, produce and sell products
- Re-thinking how we use and consume products
- Re-defining what is possible through re-use and recycling.

Find out more at
wrap.org.uk

Purpose of this document

This document provides a step-by-step ‘tool’ for the food supply chain. It provides a proven methodology to map, prioritise and characterise food by-products* and identify those which have the greatest opportunity to replace costs by adding value.

It also provides an introduction on what else needs to be considered when getting more value from these by-products*.

* Includes unavoidable wastes, effluents as well as by-products

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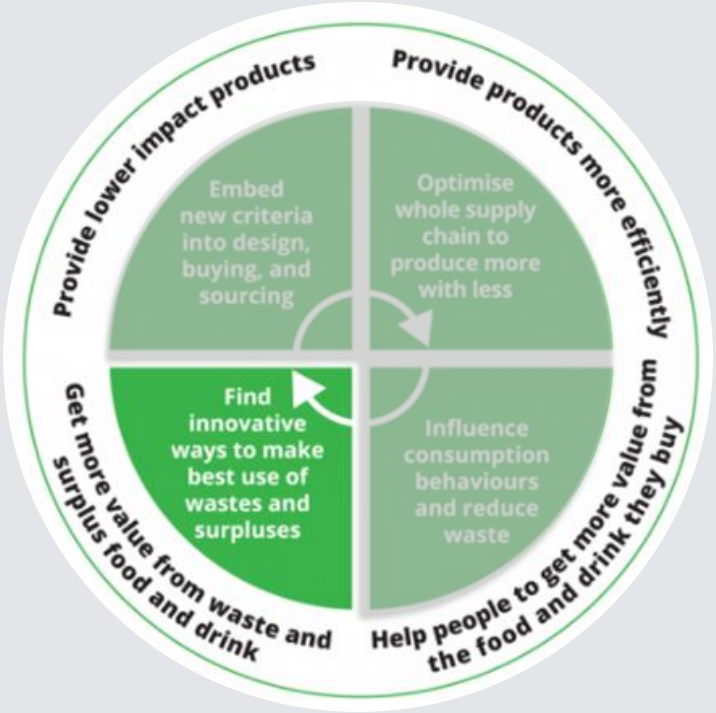
What is getting more value?

Getting more value is the process of converting food and drink by-products* into useful products such as:

- food for human consumption
- pet food
- animal feed products
- chemicals
- materials; and
- fuels

which have a greater unit value and a greater market potential.

Getting more value and Courtauld 2025

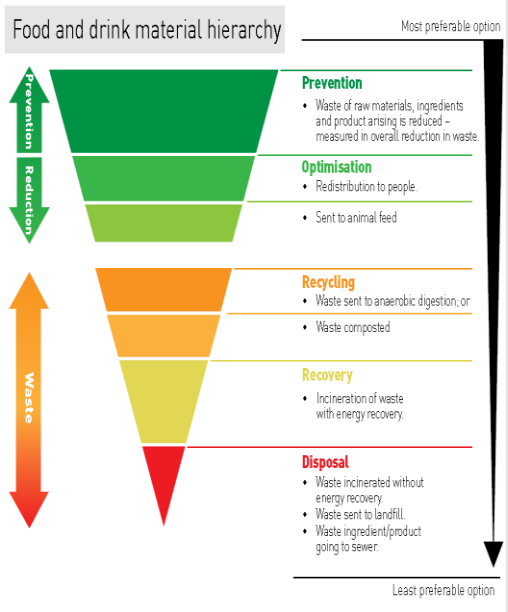


Courtauld 2025 is an ambitious voluntary agreement that brings together a broad range of organisations to make food and drink production and consumption more sustainable.

Getting more value from by-products* finds innovative ways to get more value, via:

- projects to add value to dairy, bakery, fresh produce by-products*;
- opportunities to get more value from by-products* by working with academic networks;
- internal identification, quantification and characterisation of by-products* and how value might be added to them.

Getting more value from unavoidable by-products*



In line with the waste hierarchy all unnecessary by-products* and waste flows would be eliminated or minimised.

However, for most products there remains certain by-products* that are an unavoidable part of the manufacturing process.

Getting more value from by-products* aims to:

- identify and characterise these unavoidable by-products*.
- explore higher value end-uses that may also be higher up the food waste hierarchy.

Method to identify, prioritise and characterise by-products*

1. Identify material flows	Collate information on input and output flows of materials (ingredients, products and by-products*) for specific manufacturing stages, from intake through to dispatch and distribution, for each product category.
2. Identify unavoidable by-products*	Assess which flows are likely to be targeted for reduction, versus those that are inherent and unavoidable by-products* from required processing stages, thus a likely long-term source of material for getting more value.
3. Prioritise 'hot spots'	Assess the different unavoidable by-products* against criteria to determine which may provide sufficient volume and compositional value to warrant exploration to get more value.
4. Characterise prioritised by-products*	Investigate the prioritised 'hot spot' by-products* to understand and characterise the material itself, as well as detail of the current segregation, treatments, collection procedures etc.

1. Identify material flows

Site data gathering

Most, if not all, of the internal data will already exist within the business either:

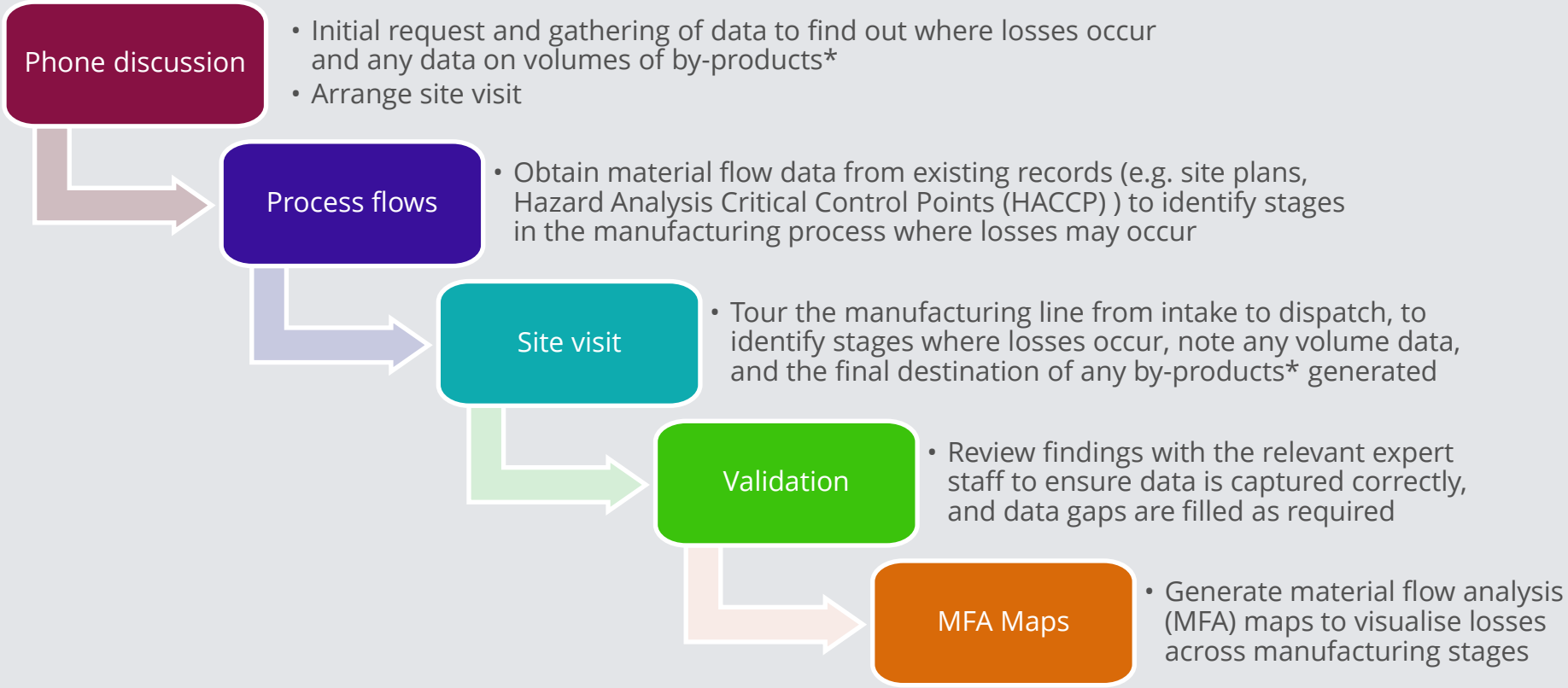
- explicitly (databases or documentation) or;
- implicitly (residing as knowledge in key personnel).

The level of resource required for the four stages of the evaluation will depend upon the existing level of data owned by the company, and access to relevant data points. It may be a very quick exercise requiring little effort, or may require extrapolation of existing data, measurement of certain flows and discussions with staff members.

Having this information collated for the purpose of exploring opportunities to get more value from by-products* will help pinpoint the most appropriate opportunities and internal barriers to specific options, and therefore is a vital part of the process.

1. Identify material flows

Site data gathering



1. Identify material flows

Site data gathering

Material flow analysis by-product* checklist:

- ❑ **Intake, processing, packing and dispatch stages**

- ❑ **Losses relating to:**
  - ❑ Out of spec material
  - ❑ Samples
  - ❑ Spills and losses during transport
  - ❑ Cleaning processes and residues on lines, and in tanks and pipes
  - ❑ Inedible material
  - ❑ Packaging, weight or label rejects (where not reworked)

Separator desludge is an 'unavoidable' by-product from milk processing
Photo: www.andritz.com

1. Identify material flows

Process flow diagrams converted to **Material Flow Analysis (MFA)** to visualise all by-products* from a product category line.

Software
- One example is STAN
  - stan2web.net/
  - Freeware
  - Available online
  - Sankey functionality

Key

I: Material import
E: Material export
F: Flow

Intake

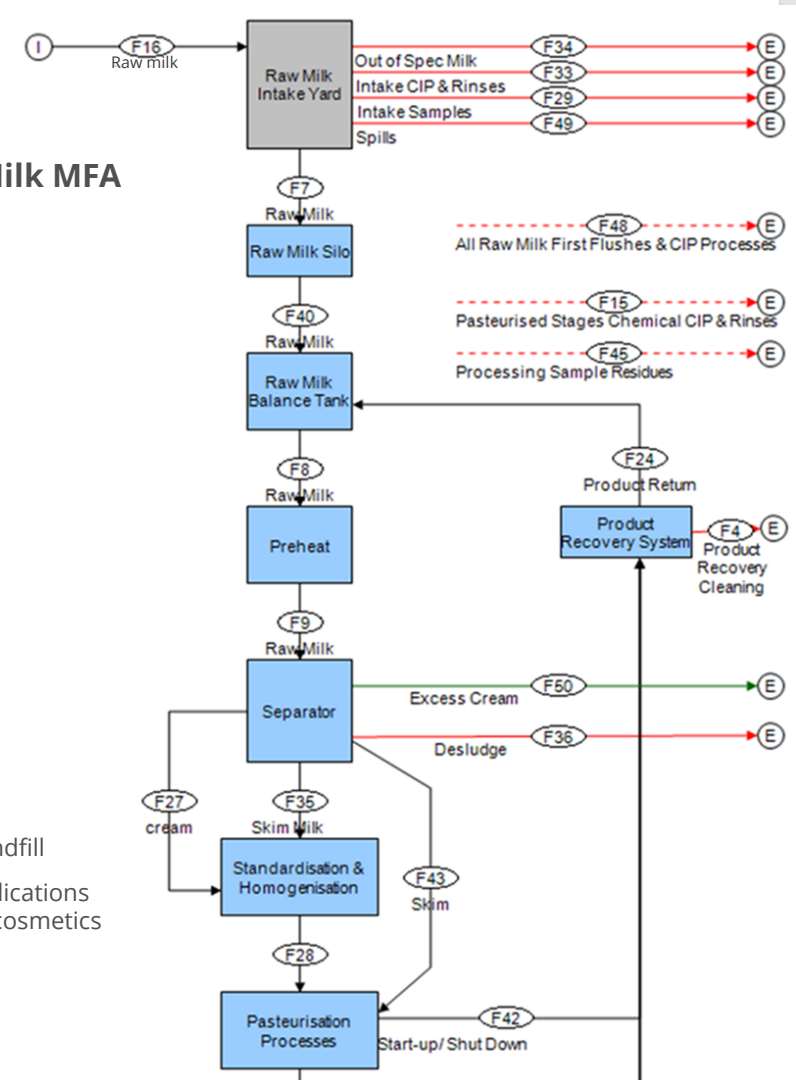
Processing

Typically to effluent or landfill

Typically to non food applications e.g. animal feed, fats for cosmetics

Food product

Example Milk MFA

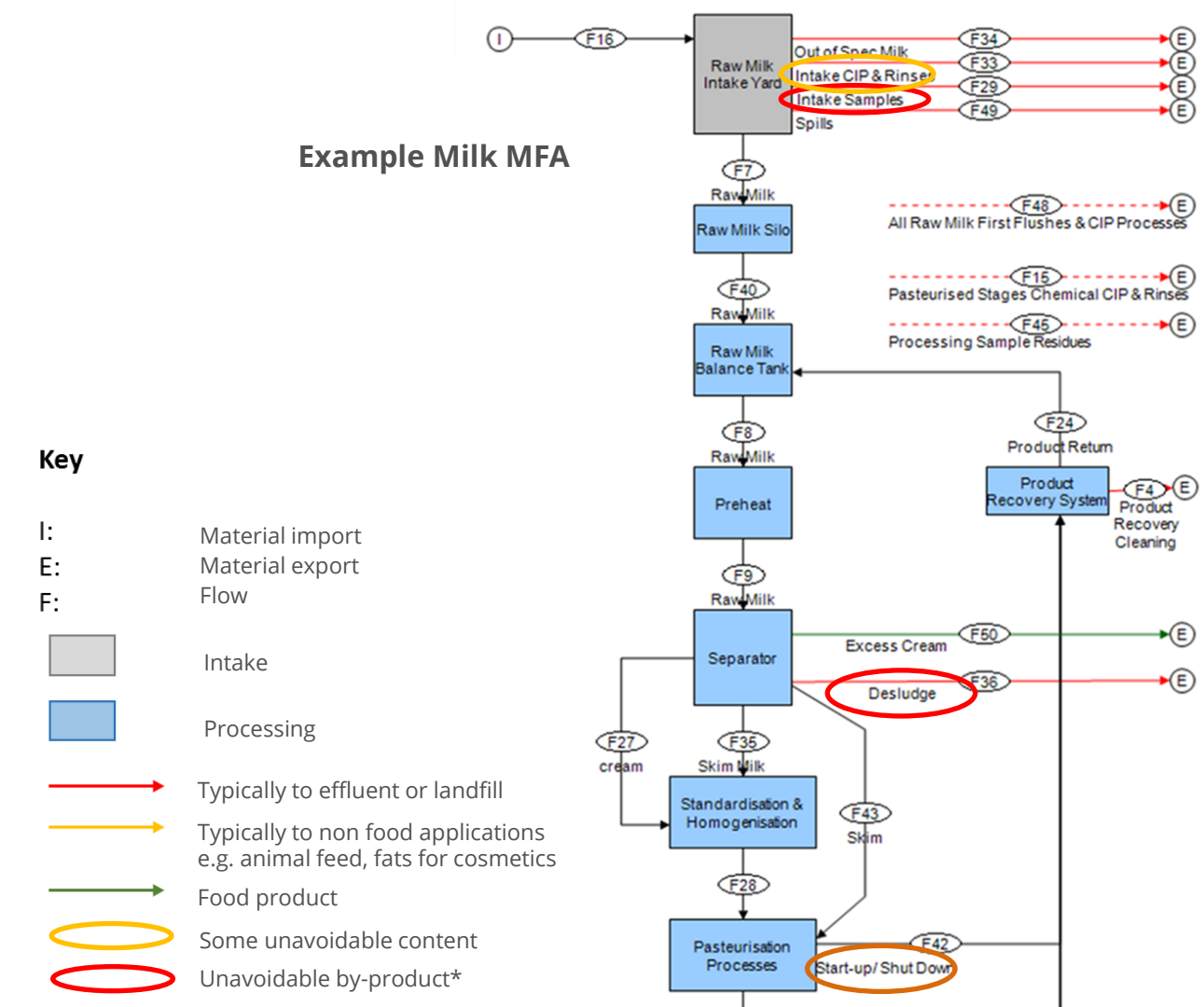


2. Identify unavoidable by-products*

Use the MFA maps to highlight flows of by-products* that are unavoidable, where they are:

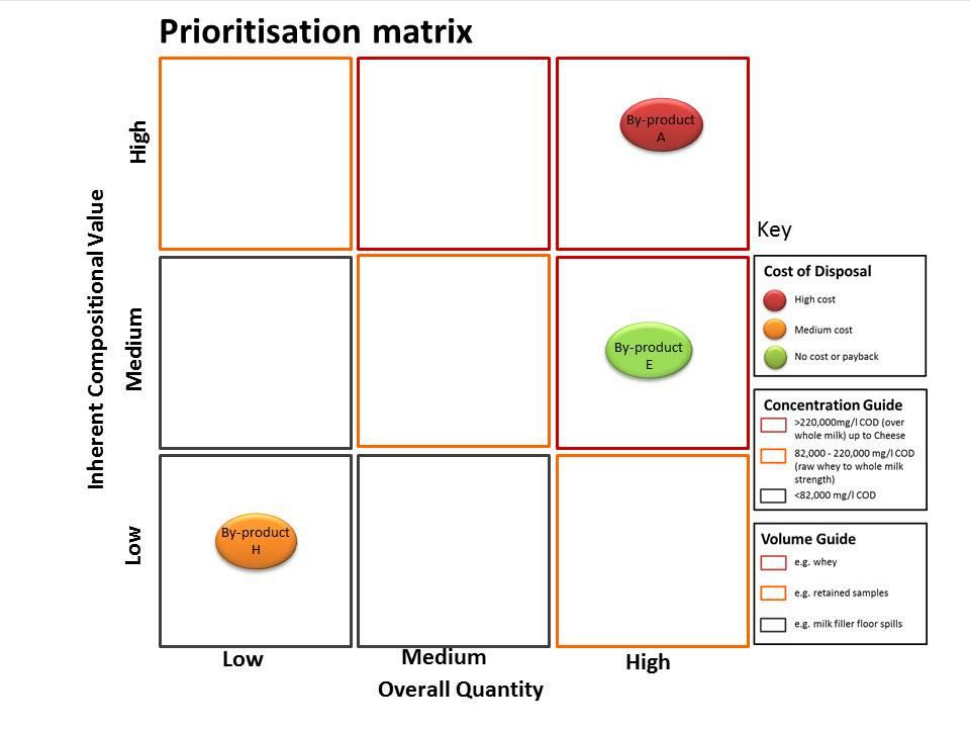
- An inherent part of the process
- Challenging or impossible to reduce or eliminate

Example Milk MFA



3. Prioritise 'hot spots'

Scoring matrix



Map out all the unavoidable by-products* to prioritise those with likely potential to get more value. A workshop can be conducted with key personnel to confirm and agree priority by-products* for further investigation.

Specific criteria need to be adapted depending on each product category, for example, consider:

- Quantity
  - Is there sufficient volume to warrant getting more value
  - Also consider consistency – is there a manageable variation
- Compositional value
  - High water content reduces the value
  - High fat or protein content may enhance value
  - Active or functional constituents can enhance value
  - Also consider consistency, manageable variation, and quality
- Cost of disposal / Current revenues
  - High cost of disposal indicates business case to find uses or
  - Low revenue from material may be enhanced

Where High=3 points; Medium=2 points; Low=1 point

3. Prioritise 'hot spots'

Scoring and prioritisation

Flow no.	By-product	quantity score	compositional score	disposal cost score	total score
11	A	3	3	3	9
10	B	3	3	3	9
12	C	2	3	3	8
4	D	3	2	2	7
20	E	3	2	1	6
22	F	2	1	2	5
2	G	1	1	3	5
3	H	1	1	2	4

Strong potential for getting more value. Consider investigating further.

Unlikely to be suitable candidates for getting more value.

Add the scores allocated in the prioritisation matrix against the three criteria and rank them accordingly. The scoring should be reviewed at the end of, or following the workshop.

Further discussion with the team may further refine the top scoring by-products*, to then agree on the key priorities moving forwards.

4. Characterise prioritised by products*

Key questions to characterise unavoidable 'hot spots'

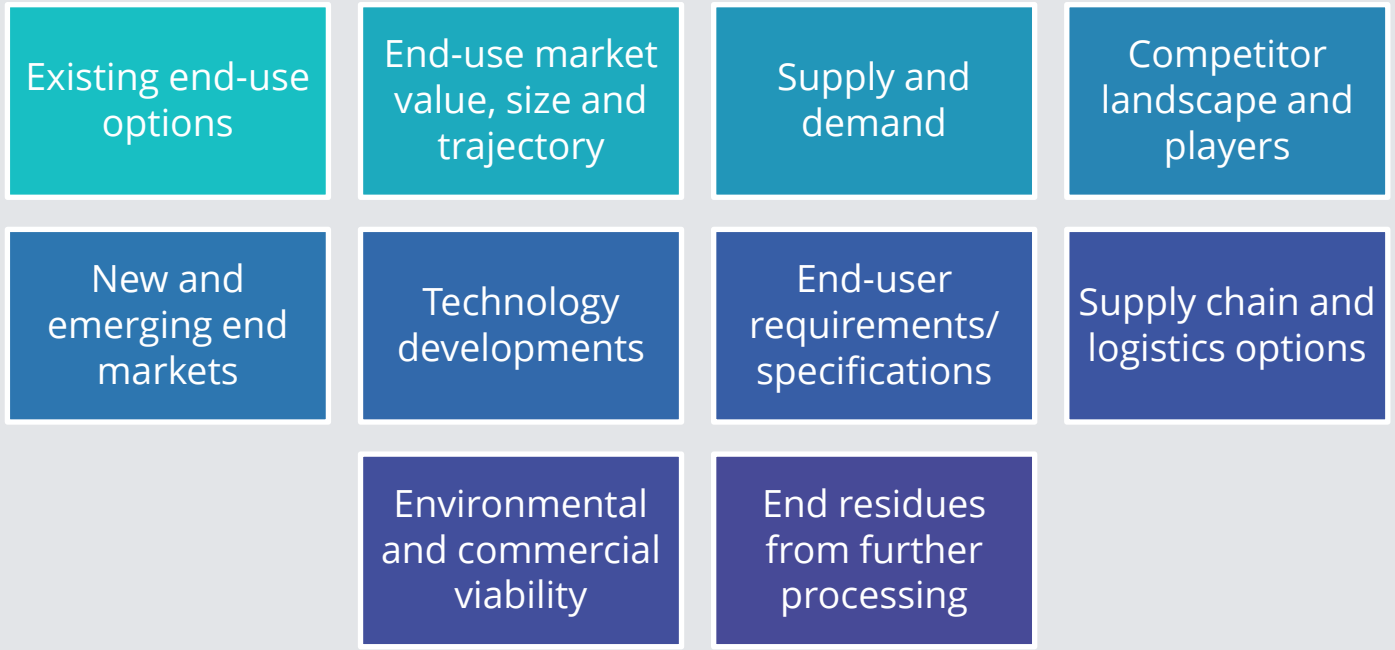
Flow	What are the **quantities**, **composition**, and **quality** e.g. food, animal feed grade and how do these vary over time?
Treatments	What further processing stages does the by-product* undergo e.g. sterilisation?
Segregation	How is the material segregated from other streams? Is it mixed with other materials?
Storage	How is the material stored and how does this affect the quality?
Collection	How frequently is material collected, and in what volumes? Does the collection cost the business or generate revenues?
Final Destination	What is the final destination and use e.g. food, animal feed, landfill?

4. Characterise prioritised by-products*

Internal factors to consider when evaluating options to get more value

Flow Variation	How might the quantities, composition, and quality impact supply? What might limit the supply of the by-product*?
Treatments	What facilities are there on-site, or nearby, for additional treatments to stabilise the material or improve quality?
Segregation	Would it be possible to segregate the material in a different way to capture higher value fractions and/or prevent contamination?
Storage	What is the potential capacity for storage? Is there spare capacity? Could additional facilities be utilised to improve the quality of by-products*?
Collection	What are the limitations to collection from the site e.g. access?
Final Destination	Are there existing supply chain or end-user relationships that could be developed to establish new uses for the by-product*?

External factors to consider when evaluating ways to replace costs by getting more value from by-products*



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