

A photograph of several ripe oranges hanging from a tree branch with green leaves, set against a dark blue background. The oranges are the central focus of the image.

Oranges are the new black

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Vision

To create a more sustainable and environmental friendly utilization of orange waste

Orange peel waste

Composition

Monosaccharides	Protein	Cellulose	Hemicellulose	Ash	Lignin	Pectin	D-limonene	TPC
~41	7.9±0.1	8.10±0.46	13.8±0.3	1.7±0.1	1±0.01	4.83*	0.346*	0.01171*

Table 1: Components of orange peel (% w/w dry basis) (V. Negro, 2016).

* From (M. Boukroufa, 2014). Pectin, D-limonene, TPC (Total Phenolic Compounds) [% orange fruit].

Application

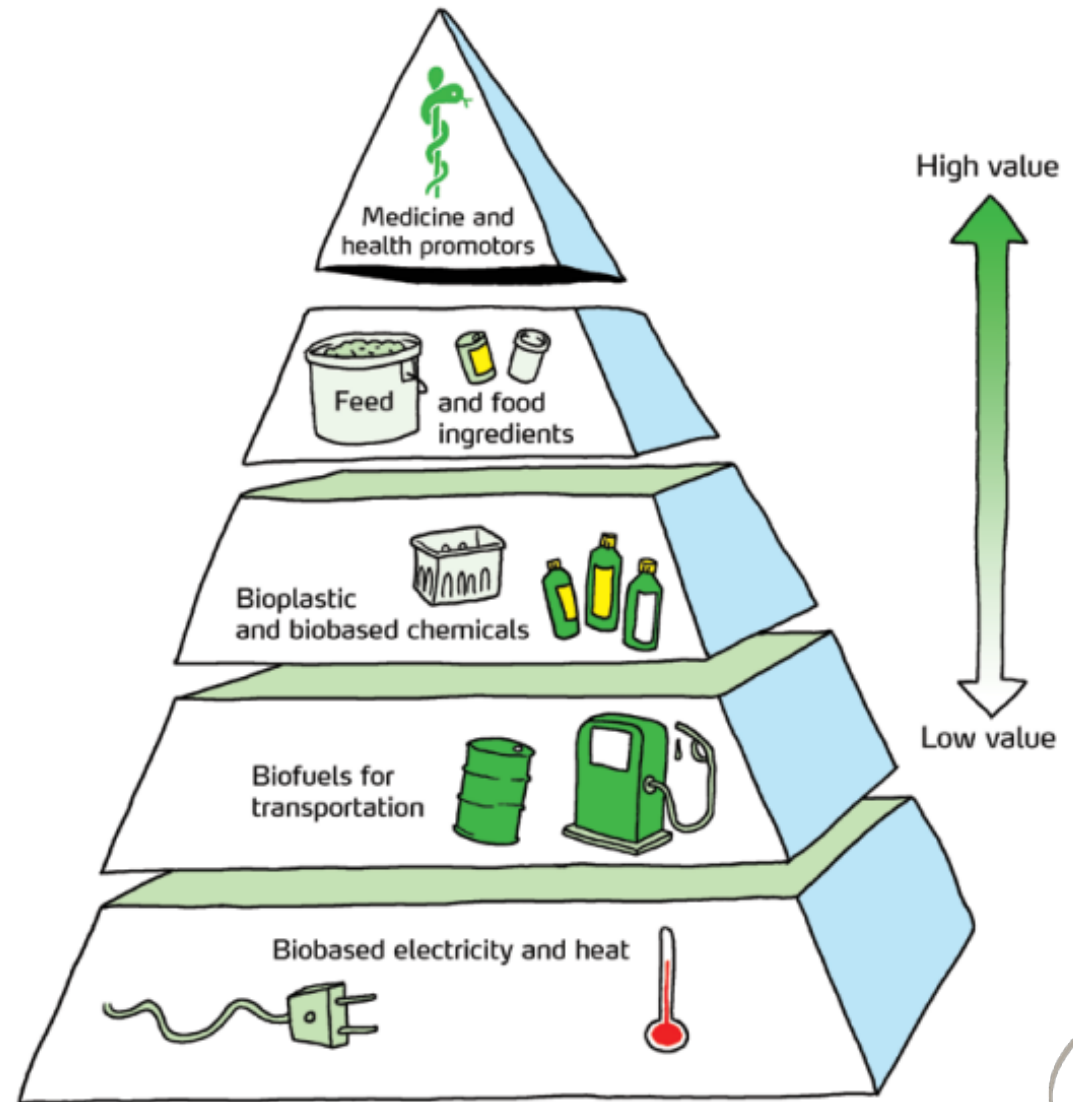
D-limonene	Polyphenols	Pectin	Biofuel
<ul style="list-style-type: none">• Flavor and aroma agent• Botanical insecticide• Paint stripper	<ul style="list-style-type: none">• Dyes• Antioxidant• Food additive	<ul style="list-style-type: none">• Gelatine agent• Fat and sugar replacement	<ul style="list-style-type: none">• Biogas• Bioethanol

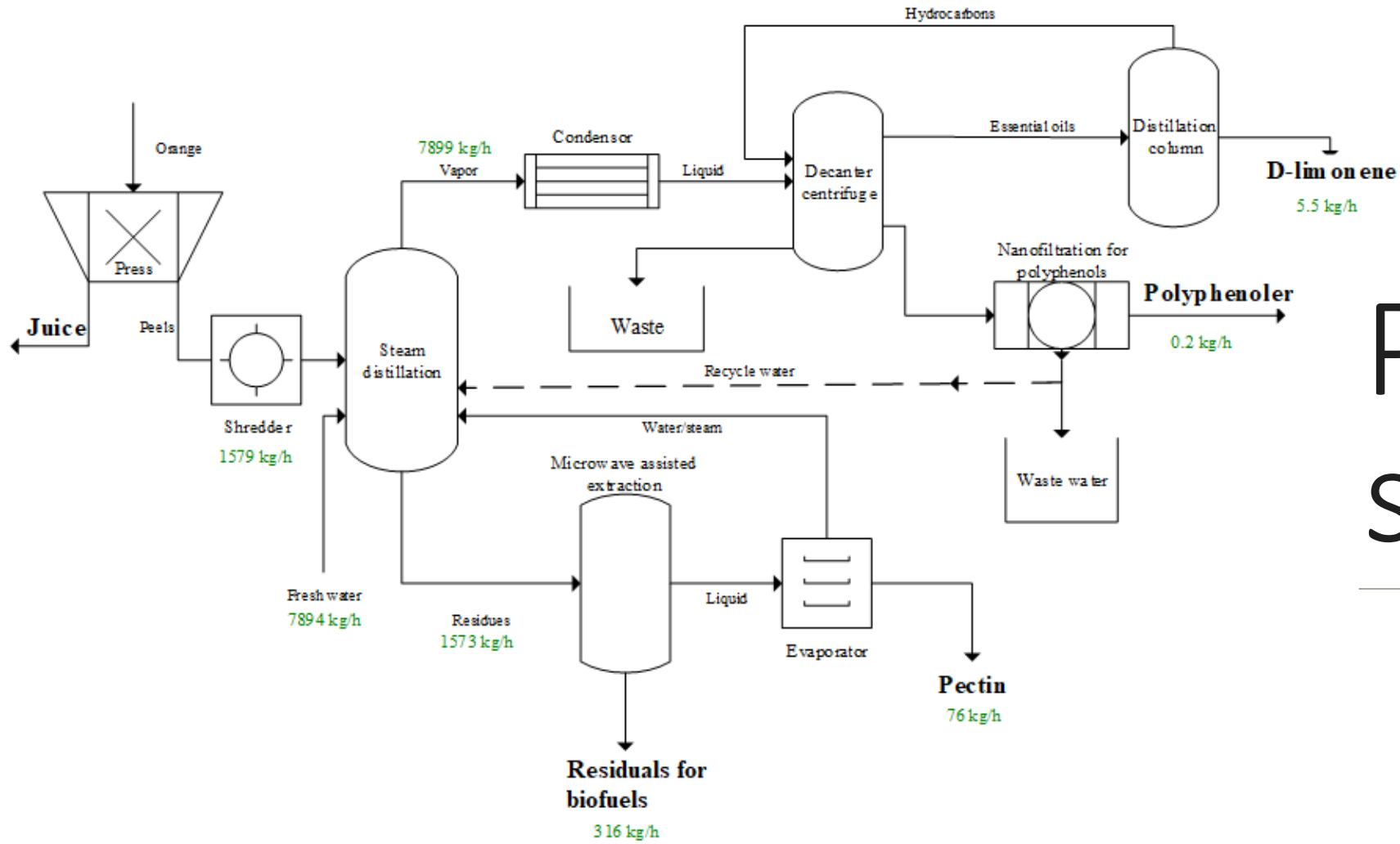
Product value

Current application: Cattle feed

Utilization of the full biomass potential:

- Energy content
- Structural building blocks
- Nutritional value





Process scheme

Environmental impact

Production 1: Orange juice

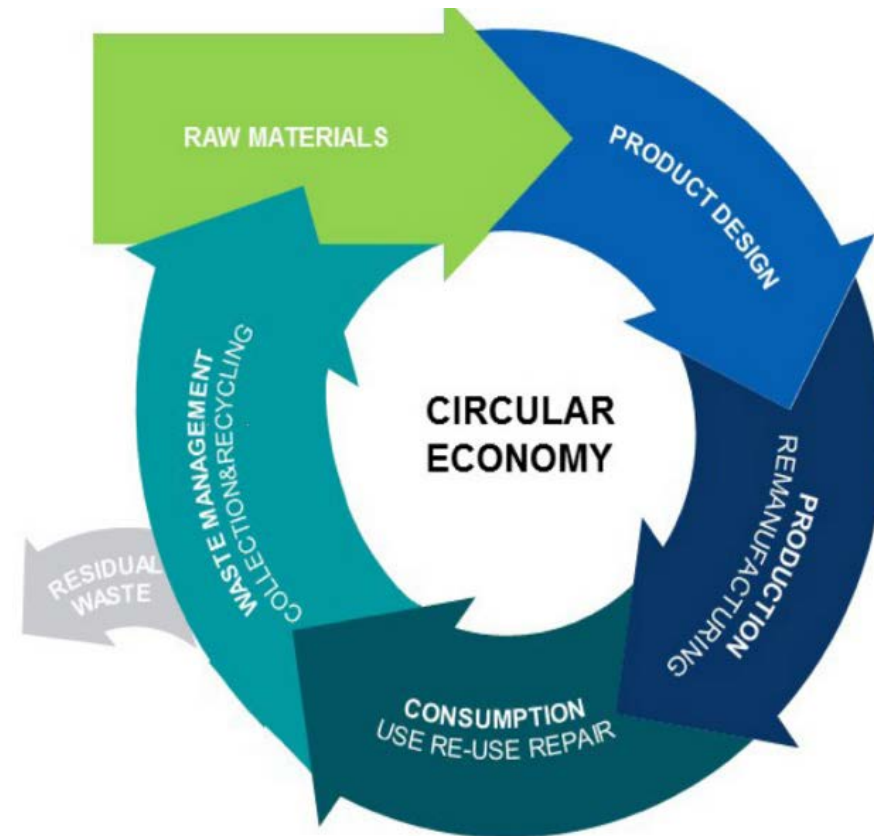
- **Raw material:** Oranges
- **Waste:** Orange peels

Production 2: Extraction of high value products

- **Raw materials:** Orange peels
- **Waste:** Dried material

Production 3: Biofuel

- **Raw materials:** Dried material
- **Waste:** Biofuels



Economic viability

Info		Unit
Total capital investment	1,620,000	€
Process operating hours	5,000	hr/year
Operating days per year	208	days/year
Water used (per year)	39,500	m ³ /yr
Total production cost	1,740,000	€
Total sales	3,920,000	€
EBITDA ^{b)}	2,180,000	€
Depreciation ^{a)}	222,000	€

a) Earnings before interest, taxes, depreciation and amortization.

b) Linear depreciation over 5 years.

- Return on Investment: 0.88
- Pay back period: 0.39

Market strategy

