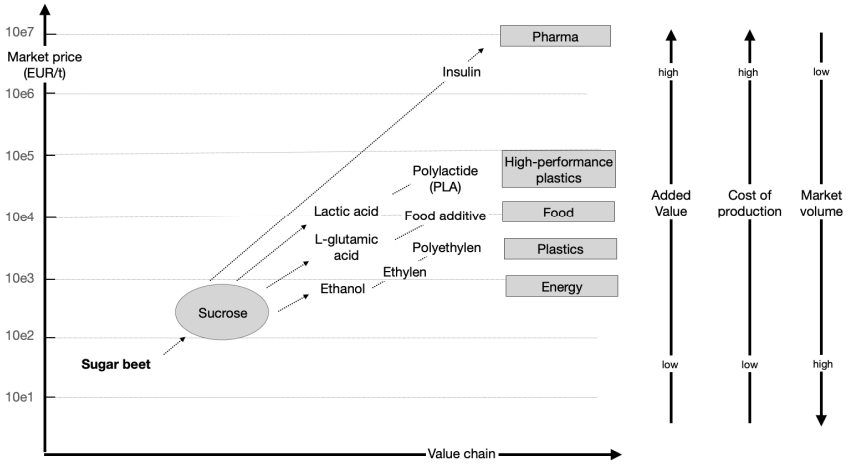
Supplement S2. Value creation potential of products derived from sugar beet

Table S2 illustrates various value creation options and key data using sugar beet utilization as an example. Sugar beets have a market price of EUR 40-50/ton. They contain approximately 20% sugar, which has a market price of EUR 400-500/t. Higher added value can be achieved by processing the sugar into ethanol, L-glutamic acid, lactic acid, or insulin. Table S1 shows the published extraction or transformation yield for various products. This value indicates how much sucrose is required for production. Additionally, the desired quality grade significantly influences production costs. Pharmaceutical-grade quality has the highest requirements. The market price per ton of insulin shown in Table S1 was extrapolated from the market price of insulin vials (3.5 mg/vial) and is only used for comparative purposes. Ethanol and lactic acid could be used to develop product and value chains further in the direction of chemical production, especially polymers.

Table S2: Key economic data of sugar beet, sucrose and derived products (EU, 2025).

Product	**Yield (g product /g sugar)**	**Reference (Yield)**	**Quality grade**	**Market price (EUR/t) (EU, 2025)**	**Reference (Market price)**
			Extraction yield (t sugar/t sugar beet)		
Sugar beet			Industrial specification	40-50	[97]
Sucrose	0,20	[92]	Food grade	400-500	[97]
			Transformation yield (t product/t sucrose)		
Ethanol	0,5	[93]	EN15736	900-1100	[97]
L-glutamic acid	0,5	[94]	Food grade	1500-2000	[98]
Lactic acid	0,9	[95]	Food grade	9000-11000	[99]
Insulin	0,001	[96]	Pharma grade	2600000000	[100]

Figure S1 illustrates the interaction of product category, target market, cost



of production, market volume, on added value and market price.

Figure S1. Value creation of selected products derived from sugar beet (market prices as of 2025, EU).